ISASC

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QUARTERLY MAGAZINE OF THE INTERNATIONAL SOCIETY OF ANTIQUE SCALE COLLECTORS

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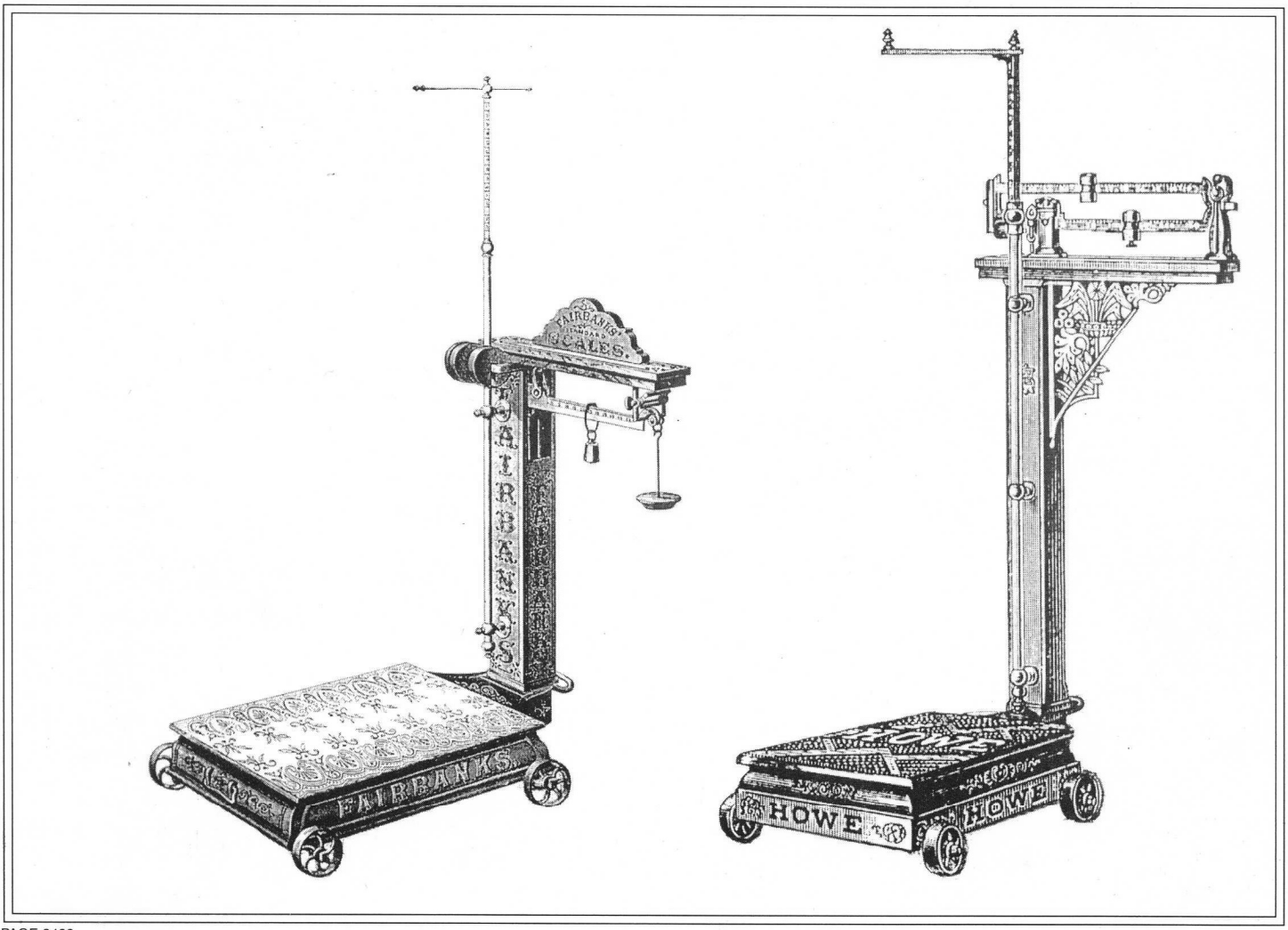
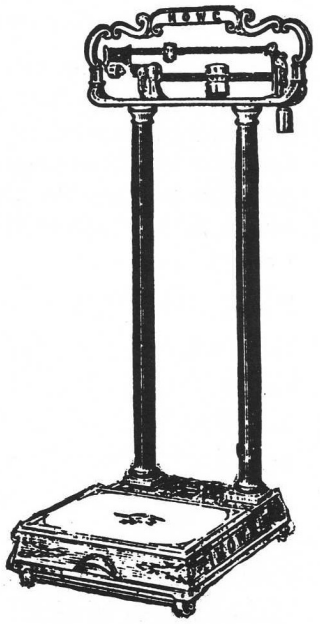


Cover Picture

Left. E & T Fairbanks Weighing Machine (shown in their 1882 catalogue) is very obviously one of Fairbanks' commercial machines, such as they produced for use in cheese factories, but adapted for private use. When for a cheese factory, it was undecorated and cost $33.00. When furnished to order, with extra finish, it was $50.00 and upwards. Fairbanks state *For weighing and Measuring the Height of People. For use in Hotels, Life Insurance Offices, Gymnasiums and Recruiting Offices.*

Right. Howe Scale Company Fancy Weighing and Measuring Scales (1896 and 1899 catalogues) is just as obviously one of Howe's Crown Beam Scales, with added refinements. For commercial use, it was $38.00, but for weighing people, with luxury wood etc., it was $70.00. *The pillar and cap are of oak, cherry or black walnut, highly polished; beam, measuring rod and trimmings nickeled. Brass platform and polished wheels. Bronze bracket under cap*. Nickel gave a very robust finish and was highly fashionable.



This page. Howe Physicians' Scale *recently designed* (between 1896 and 1899), *to meet the large and increasing demand for a personal scale*. Constructed entirely of metal, it was supplied in red with bronze ornamentation for $30.00 or in white or blue enamel and gold for $42.00. The Nickel plated Measuring Rod was $13.00 extra.

See pages 2423-2436 for coin-operated machine developments.

ISASC
INTERNATIONAL SOCIETY OF ANTIQUE SCALE COLLECTORS

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Pennywise, Not Pound Foolish

Part 1, 1884-1900

Text by R HENDRICKS WILLARD
Captions by D F CRAWFORTH-HITCHINS

This is the tale of an intense attraction between a singular machine and an average American, multiplied many thousands of times from the 1880s through the 1940s. The machine is the coin-operated person scale. For nearly sixty years, these impressive scales stood watch on sidewalks, in front of businesses, in hotel lobbies, drug-stores and railway stations, wherever people congregated, enticing passers-by to deposit a coin – most often a penny – to learn their weight and perhaps their fortune. But now most penny scales are gone and largely forgotten.

Their story can now be told because of the contributions of three of their admirers, each of whom played a special role in publicising their charms, establishing their popularity as collectibles, putting some of them back to work, and discovering their history through years of diligent imaginative research. We gratefully dedicate this article to those gentlemen: the late Gerald E "Red" Meade, the late Richard M Bueschel and current member of ISASC, William F Berning.

Part 1, 1884-1900

Automatic selling machines are not a modern invention. Ancient Greek records indicate that, in 219 B.C.E., Hero of Alexandria invented a device for dispensing holy water to temple visitors who deposited a few drachmas. But there are only a few scattered references to automatic merchandising devices before the early 1880s, when the idea took hold in both England and Germany. By coincidence coin-operated scales from both countries arrived in the United States in 1885.

Percival Everitt

The London engineer known as *the Father of British Coin Machines* was among the British inventors who came to the US to take advantage of the enormous and growing market and the ease with which impecunious inventors could patent their inventions here. By 1884 Everitt had already invented a scale and numerous other automatic machines and patented them in England, throughout the British Commonwealth, France, Germany, Austro-Hungary, Belgium, and elsewhere.[1] Wherever he went, Everitt sought legal protection as well as local production.

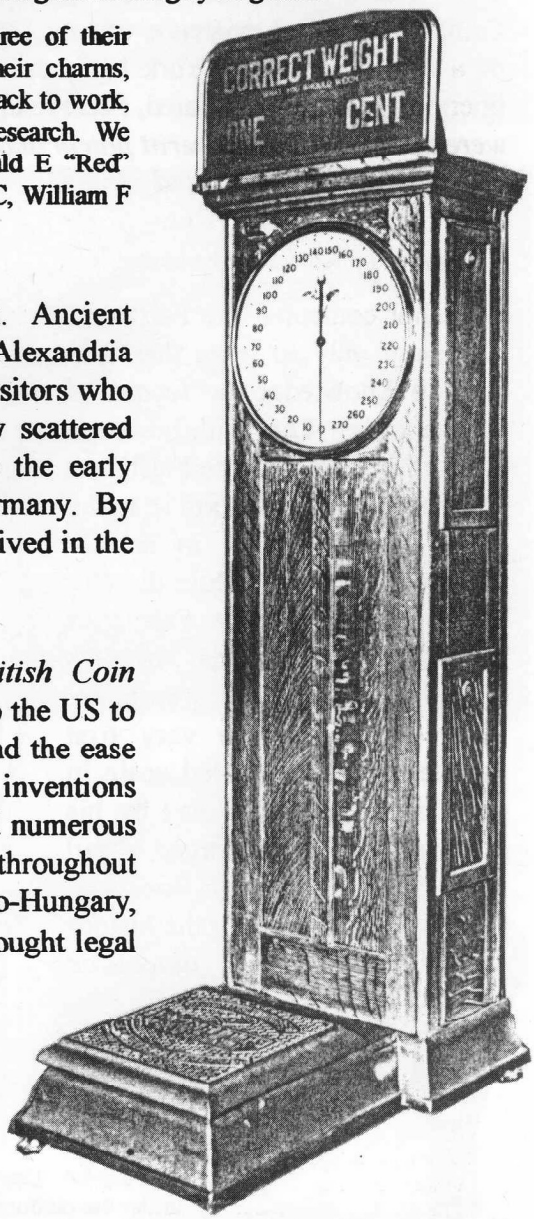


Fig. 1. ⋀⋀ Everitt's patent Weighing Machine and step-plate made by E & T Fairbanks between 1885 and the early 1890s. Everitt's patent scales were included in the inventory of the National Weighing Machine Co. as part of the stock that L W Baldwin gathered together in 1887.
Courtesy R M Bueschel

Fig. 2. ≺≺ Platform of both surviving examples of Fairbanks Everitt's patent scales.
Photo J Berning

E. & T. Fairbanks Company

The E & T Fairbanks Co., one of America's leading exporting firms at the time, looked to be the ideal firm to produce Everitt's scale in the United States. In March of 1885 Everitt arrived in St. Johnsbury, Vermont, bringing a sample of the coin-controlled scale that he had invented the year before. See pages 2433-2435. Typical of the times, the mechanism was housed in a boxy wooden case. Fairbanks produced the *Everitt's Patent* scale from March 1885 into the early 1890s, making it the earliest coin-op scale produced in the United States.[2]

Until around 1976, when author Richard Bueschel began his research, the only known evidence of Fairbanks' scales' existence was an 1898 postcard showing an Everitt's Patent scale in the lobby of a fashionable New York bar-room. Bueschel recalled a 1932 article in which an old-time operator, H H Brown, stated, *I can remember the first* [coin-op] *scales made in this country. They were made under the Everitt patent and some were made by the E & T Fairbanks Company of St. Johnsbury, Vermont and some were made by the Howe Scale Company of Rutland, Vermont.*[3]

Bueschel contacted the Fairbanks Company only to learn that they had no knowledge or record of such a scale. They did, however, forward his letter to the Fairbanks Museum and Planetarium in town. After poking around in an old storage shed, the museum director unearthed an ancient Fairbanks scale with the words *Everitt's Patent* cast into its step-plate. They had found the very first production coin-operated scale in the United States! Elated by his discovery, Bueschel forged ahead with his project of locating, preserving, and sharing the history of these popular ***automatic***

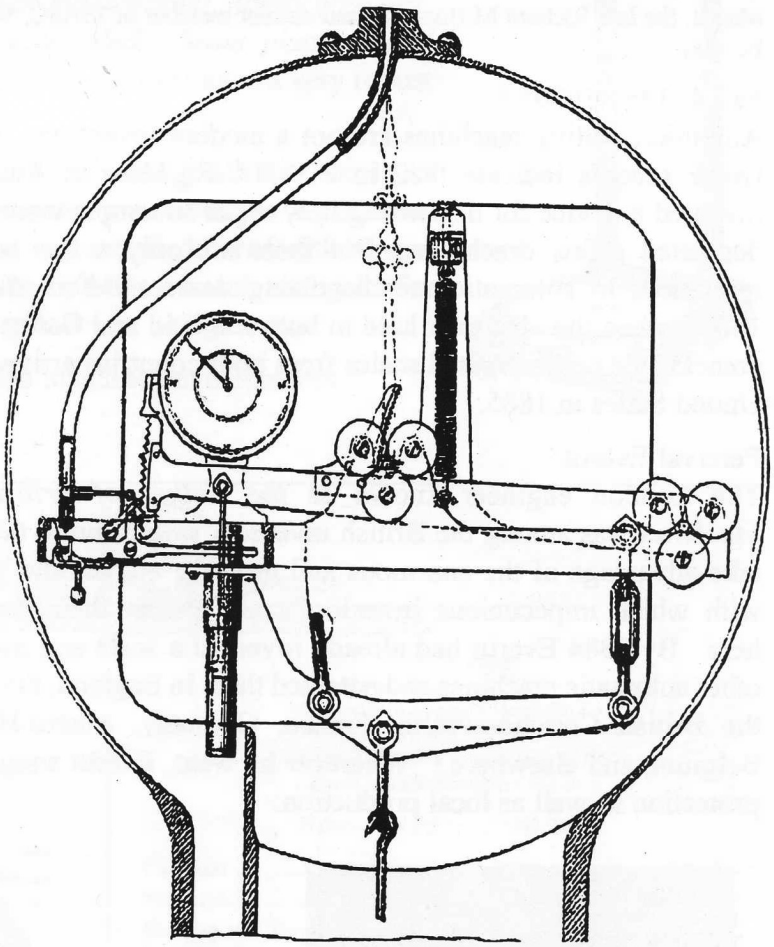


Fig. 3. ⩓ Davenport's US patent no. 396,394 of Jan 22 1889 had compound levers under the platform, and compound levers in the head, so that the pull on the spring was greatly diminished. These features were conventional, and were not the subject of the patent. The long lever going right across the centre was immovable until a coin released the pawl at its left-hand end; this was the subject of the patent. The long lever had excellent roller-bearings, a dash-pot to reduce vibration, and a curved rack pressing against the fulcrum of the pointer. It had a trip-switch to re-set the mechanism. Even the pointer had three rollers each side of its bearing.

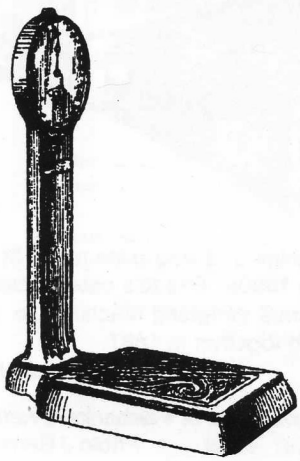


Fig 4. ⩔ Davenport first filed his patent March 4 1887, so these ideas are very early. Judging by the drawing of the exterior, the machine was only hip height.

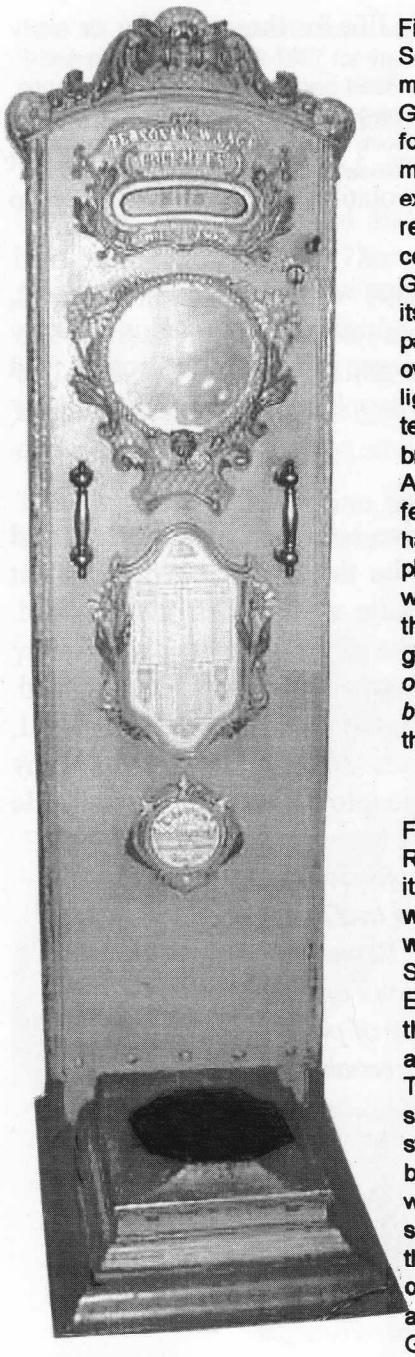


Fig.5. ≺≺ Columbus Scale, 82 ins (1843 mm) high, made in Germany and adapted for the American market. Meade's example was painted recently in vivid colours but this German one still has its original delicate paint, (bronze-gold all over the body, highlighted with bronze, terracotta, cream and bronze-green, a truly Art Nouveau confection). Below the handles is a porcelain plate let into the case, which has a chart on the American one giving *Scale of weight of average human beings*. A key opens the rear door.

Courtesy M Hass

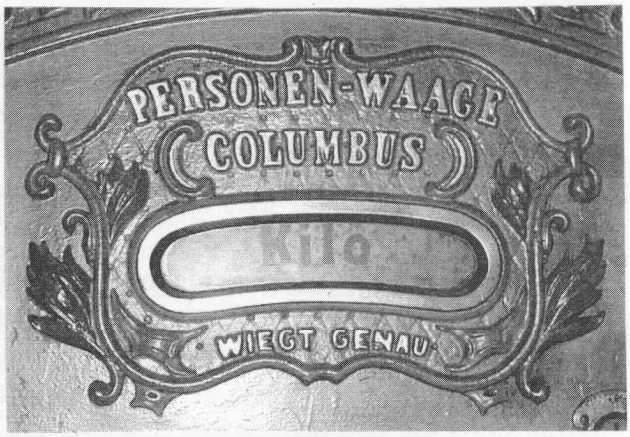


Fig. 6. ≻≻ Top Round the viewing slot it says **PERSONEN WAAGE** COLUMBUS **WIEGT GENAU** (Person Scale COLUMBUS Exact Weight) on both the American import and the German one. The scale operated as soon as a person stood on the platform, but only when the coin was inserted did the shutter drop to reveal the weight, in pounds on the American one, and kilos on the German one.

Courtesy M Hass

Fig. 7. ≻≻ middle The version found in Germany has the name of the rental operator *Eigentum der Automaten-Actiengesellschaft Hartwig & Vogel Automaten BERLIN* where the American version has a mirror. Note that the plaque is held by three accessible screws, enabling the operator to apply his own plaque while he held the franchise.

Fig. 8. ≻≻ Seeing this imposing machine, with its combination of allusions to the countryside and to Baroque art, it is not surprising that the Americans were very enthusiastic about them.

Courtesy Matthias Hass & Red Meade

machines, which were to play a prominent role in American daily life for the next fifty or sixty years.

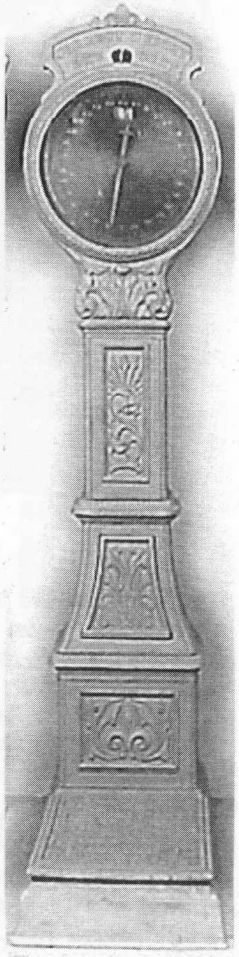
In 1887 Fairbanks introduced its own Coin-controlled Weighing Machine, patented by William S Davenport,[4] and a forerunner of the Big Head silhouette. (See figs. 3 & 4.) But it never caught on, and with an uncertain economy, Fairbanks dropped out of the volatile coin machine market to concentrate on its industrial and commercial lines.

Everitt, however, stayed to launch the industry here and earn a fortune with his vending, shocking, strength-testing and weighing machines. And from this modest beginning, an enormous industry developed. By the middle 1890s American coin-operated machines, especially the scales, had found a world market, with dozens of models to be seen wherever people congregated—primarily in transportation terminals at first.

German Imports

Also in 1885, a group of New York promoters imported six massive coin-operated scales, called the Columbus, (figs. 5-8) made by a German company, said to be the Deutsch-Wright Patent Company. Tthese seven-foot tall, 600 pound beauties caused quite a stir when they arrived. Designed for indoor use, they resembled the grandfather clocks of the period with their elaborately decorated cases. The promoters installed the scales in train stations where the public congregated. They were popular - and profitable - for over twenty years, but with the approach of World War I, they were all destroyed because of the German writing on the front. All but one, that is. Many years later, the only surviving Deutsch-Wright Columbus scale came into Meade's possession. He shared his recollections in an interview:

This is it. It's a beautiful scale. This is the only known one. The coin slot was made to take any size of coin. When I acquired the scale, it had been in a man's house for 71 years. He died, and the family let me buy it from them. Remember, from 1885 to 1909, you had nothing but Indian head pennies. So when I opened it up, it was loaded with Indian head pennies and gold coins. Lots of people put gold coins in scales. They only had a value of $2.50, so if they reached in their pocket and didn't have anything else, they'd use them.



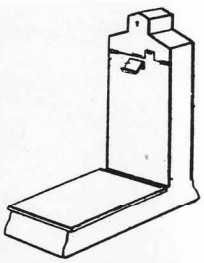
Blauvelt, Jay and Blauven

Only a year later, in 1886, Blauvelt, Joy & Blauven made the first American cast-iron coin-operated scale. See Fig. 9.

United States Machine and Invention Company

Bueschel's next major discovery came about in 1978, when he wrote to "Librarian" in Flagtown NJ, the home of late 19th-century slot-machine producer, Clement C Clawson. While Flagtown actually has no library, his letter was answered by a kind woman who put him in touch with Bill Fowler of Boonton, NJ, the current owner of the Clawson Machine Co. Bueschel boarded the next 'plane to New Jersey, where he found a shack-like structure simply stuffed with old engineering drawings, copper advertisng cuts, and product photos dating to the 1880s. There was also a wealth of material on the incredible Fortune and Fortune Musical Coin-operated scales made by

Fig. 9. ➢➢ Blauvelt, Joy & Blauven spring scale. On the marquee above the dial, it says CORRECT WEIGHT ONE CENT. Cast-iron, 69ins (1522mm) high. Brass face. This example has been stripped of its finish. Courtesy Red Meade & J Julia[6]



Figs. 10. ➤➤ The United States Machine and Inventions Company of New York took out the first British patent on July 12 1887 for the application of ticket-printing to person weighing machines. The principle of ticketting had long been applied to industrial weighing. Many earlier tickets were only embossed with the weight, but this machine inked the numbers or was pressed against carbon-paper, giving an easier reading. Note the small size for this unobtrusive machine, which must have failed to attract the eye of the casual passer-by!

Clawsons' original United States Machine and Inventions Co. in New York City between 1888 and 1889. *That discovery*, wrote Bueschel, *was made with a safety factor of only a few hours*. Fowler had an appointment to sell all of it, including machine-castings and parts, as flea-market fare the very next day. Needless to say, Bueschel topped the dealer's offer and took the lot, later selling the slot-machines and parts to another vintage coin-op dealer and keeping the musical scale graphics, records and product photos. He concluded happily, *It was original history of coin-op scales that had been shelved by time, awaiting rediscovery.*

The United States Machine and Invention Company took out three British patents on July 12th 1887 for a weight-lifting platform scale with coin-freeing and a dated ticket delivery system. This seems important, if it was made, because it utilised weight-lifting. The load was *balanced by a series of weights connected to a steel band wound upon a drum which weights were successively raised until equilibrium was achieved.* [This is descibed in the patent, but not illustrated.] It had movable type mounted on a rubber band that was pushed out by a mechanical finger. A ribbon of carbon paper was shifted to a unused section to press each ticket. It had a shutter that closed the coin-slot when nothing was on the platform to *prevent premature introduction*. A stationary knife was in the spout, to cut a string should one be attached to the coin!

Fig. 11. ➤➤ This photo was found in the archives of the US Machines & Inventions Co. If it is one of their own designs, could it be the eye-catching version of the patent above? It says on the marquee STAND STILL ON PLATFORM FIVE SECONDS BEFORE INSERTING PENNY WAIT FOR CARD. Text on platform illegible.
Courtesy R M Bueschel & W F Berning

Their second patent had a sleeve round the weights to reduce sudden jolting, more elaborate than the conventional dash-pot. The third patent related to a height-measuring mechanism that needs a second coin to operate it, and gave a second ticket indicating height.

The United States Patent and Trademark Office proved to be a helpful starting place for Bueschel's research. In a 1990 letter to the editor of EQM, he related:
One patent of 1890 shows an enormous electrical scale patented by August Sundh of Yonkers, NY. Nothing in the records exists in Yonkers, but I did find an obituary in a 1940 copy of the New York Times. It said Sundh was 75 and got a medal from the Smithsonian Institution for his work on elevators. Elevators? Back to Yonkers. What businesses were in town in 1890? Otis Elevators! And

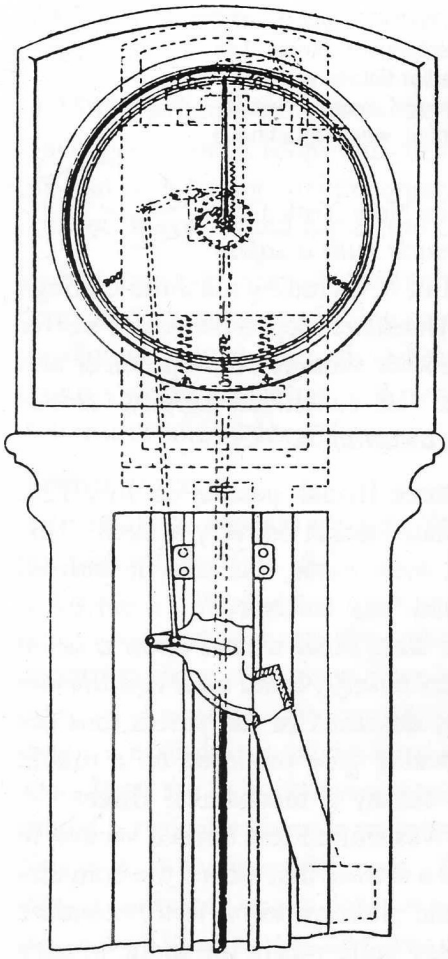
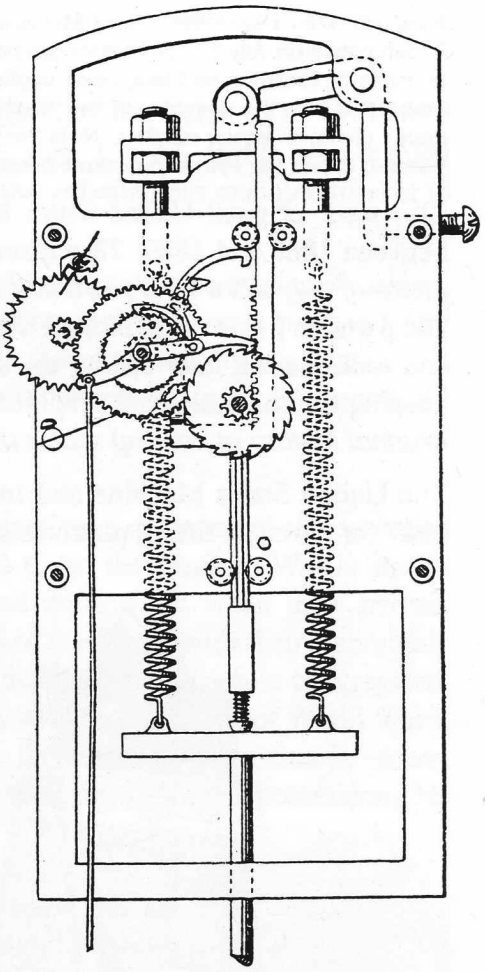


Fig. 12. ≺≺ National Weighing Machine Company Inc, British patent no 7603 of May 7 1889. Note the plain case, predating Patterson's shapely case shown in figs. 15 & 16.

Fig. 13. ➢➢ Patent no 7603. The spring balance operated when a person stood on the platform, but the pointer did not rotate until a coin was inserted, releasing the pawl and ratchet. *In a weighing machine, the combination with an index shaft, of two rachet wheels mounted on said shaft, the teeth upon one wheel being inclined in a reverse direction to those upon the other, pawls for engaging the teeth on said wheels, but normally out of engagement therewith, a third rachet wheel, also mounted on said shaft, a pawl for engaging the teeth on the last named rachet wheel, the latter operated upon the insertion of a coin, to release said last named rachet wheel and pawl, and a retarding device acting upon all said pawls, to prevent a too sudden engagement of the pawls with their respective rachet wheels.*

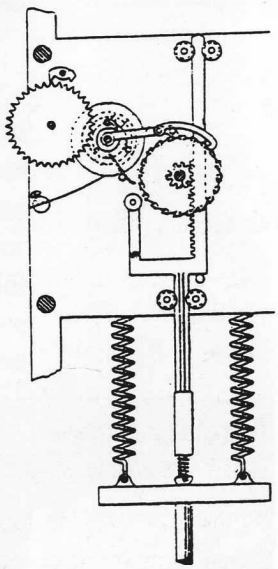


they had electrified in 1889! Guess who did it! Sundh was apparently their Chief Engineer!

National Weighing Machine Company

Because the coin-operated scales offered people their first chance to learn their weight without a visit to the doctor's office, they became wildly popular, inspiring American inventors to produce their own designs. While the industry began in Vermont and New York, before long scale-makers were turning out coin-ops in New Jersey, Illinois, Michigan, Massachusetts, Pennsylvania and Ohio. Most makers started out producing the machines and placing them within in a reasonable radius in order to operate them more easily. This tended to limit the market for a given model while at the same time discouraging the research and development necessary to develop new products. A few firms successfully continued this regional marketing policy even into the 1940s.

Fig. 14. ⩔⩔ Patent 7603 showing the pawl when a person is standing on the scale.



But big businesses were beginning to emerge in the U.S. The Standard Oil Trust formed; the wheat boom was drawing thousands to the Great Plains; and the railroad companies had divided the country into four time zones. The first to grasp the enormous advantages of a coin-scale distributorship was LeRoy W Baldwin, from Rutland VT, the home of Howe Scales. Probably inspired by the success of Fairbanks' aggressive marketing

Fig. 15. ≪ National Weighing Machine Co. Showing Patterson's design for a casing, DE 20,660 of April 7 1891 with the earlier face, [without a chart showing what you should weigh]. The step-plate has been cast without "New York" because this example was promoted by Chas B Trickey in Norwood Ohio, where customers preferred to use local products.

Courtesy R M Bueschel

Fig. 16. ≫ National Weighing Machine Co. Patterson conceived the marquee with white lettering on a red or blue background, but this one has black lettering on a white ground. The chart was patented on May 22 1900 showing *What you should weigh*, on a black semi-circular background. 70ins tall. Other styles include a black stripe round the circumference of the dial, on which the numbers stood out in white. They were commonly painted silver,[7] but collectors prettify them by picking out the palm leaves and twirls in various colours.

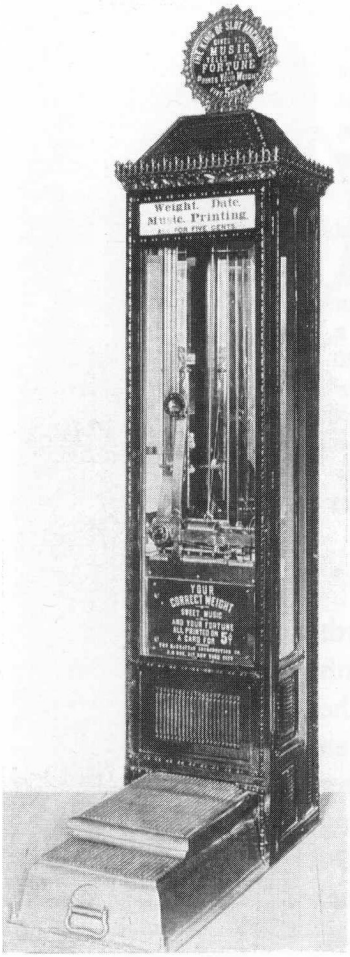
Courtesy C Steele & the Taft Museum[8]

strategy, he envisioned a multi-national North American coin-operated scale organisation with offices and adjoining routes throughout the United States and Canada. Beginning with an inventory from Fairbanks and half a dozen other scale makers, he formed the National Weighing Machine Company with head-quarters at 320 Broadway in New York City in 1887. National didn't make scales; they bought and sold them. The scales attracted both the customers—weighers— to bring in the operating money and the potential franchisees—entrepreneurs seeking new ways to make a living.

Next, perceiving the need for a readily recognizable "National Look," Baldwin hired a free-lance artist named Herman E Patterson to design a scale that would house the traditional spring-controlled mechanism within a totally different type of case. Patterson's design called for a logo-imprinted step-plate over a tapered, highly-decorated pedestal only large enough to accommodate the registering levers and the cash box. Everything else was moved into a large round cast-iron head with a dial and bezel. The weight was indicated by a pointer moving over a highly visible white porcelainised [stove-enamelled] dial capped by a marquee that said *Correct Weight One Cent*. See Fig. 15. The National Scale looked a lot like the sidewalk clocks that were beginning to appear on American streets with advertising on their marquees and cabinets.

The case was designed by H E Patterson to cover any spring-controlled mechanism that L W Baldwin owned. The cast-iron case was made for about 25 years, and was commonly painted silver. Baldwin understood parochialism, and had the step-plate (on which the person stood) altered for areas well away from New York. The step-plate normally had cast into it *The National Weighing Machine, New York*, but because people liked to patronise scales from their own area, Baldwin made step-plates that had cast into it *The National Weighing Machine* only (Fig. 15).

The scale operated as soon as a person stood on the platform, but the pointer only revolved when a cent was inserted and the little weight dropped on a cord until it hit a stop on the draw-rod, pulling



the pointer round as it dropped. The mechanism for the pointer was separate from the weighing mechanism, so the coin only tripped a little lever to permit the pointer to rotate. The patent papers describe the psychology behind coin-ops perfectly:

The pointer in the machine will tell him what his weight actually is, and knowing his height or age, he can tell by glancing at the table what his weight ought to be if he were of normal physique.... The invention greatly increases the earning power of the coin-operated weighing machine by exciting the interest of the passerby, and if his weight is found to be above or below normal average, by inducing him to try and correct the error, and by frequent subsequent operations of the machine, determining how successful he has been in endeavouring to cause his weight to approximate the normal figure.

As an operating organization, National Scale had no factories, but subcontracted their production, based on geography and cost, which allowed them to produce a great variety of scales. Both Caille and Watling had National supply their castings; consequently some scales (Weight Teller and Watling HighTop) bear either the big W for Watling or a flower for Caille. National also supplied castings for other companies, including Public Scale.

Eventually, penny scales could be seen everywhere—in restaurants, theatres, bus and train stations, and on the sidewalks in front of drug stores and other businesses. The distinctive

Fig. 17 ⩙⩙ Chicago Recording Scale Co. Musical Weighing Machine of 1894 was invented by Edward Amet, and operated by the Manhattan Introduction Co, a pioneer operator of coin-op machines. The star at the top says "THE KING OF SLOT MACHINES GIVES YOU MUSIC TELLS YOUR FORTUNE PRINTS YOUR WEIGHT ALL FOR FIVE CENTS". The bottom panel says "YOUR CORRECT WEIGHT – SWEET MUSIC – AND YOUR FORTUNE ALL PRINTED ON A CARD FOR 5¢ THE MANHATTAN INTRODUCTION CO. PO BOX 517 NEW YORK CITY".

It may have been the most expensive weigh, at a nickel, but with all the mechanisms adjusting, whirling and punching while you watched, it must have been fun to use. The decorative trim was in keeping with its expense, highly elaborate and difficult to keep free of sticky fingerprints, suggesting that this model was housed where it could be guarded. It is difficult to believe that it was actually used in a railway station!

Courtesy W F Berning & R Crandall

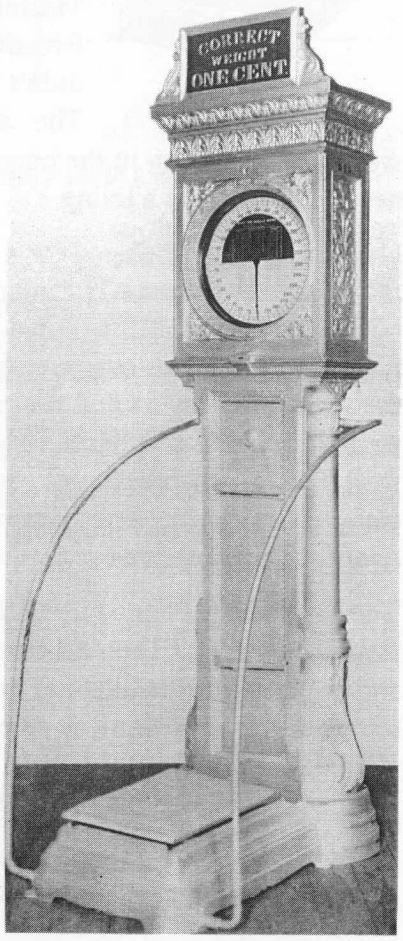
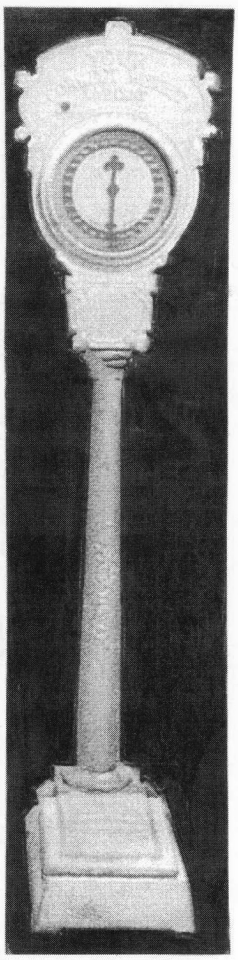


Fig. 18. ⩥⩥ The photo of this handsome cast-iron scale was found in the archives of the US Machines & Inventions Co. It might be one of their own early designs, but has a black and white dial design that suggests that it is by National Weighing Machine Co. after the new dial was designed in 1900.

To any European, it is reminiscent of Salters' designs (p 2435), big, bold and taller than the people bustling past it, quite unlike the classical lines of Patterson's design of case. The operator must have considered whether it would be robust and eye-catching in a busy public concourse such as a terminus. The sweeping handles were an extra cost, but if they prevented hurrying people from stumbling over the platform, they were worth the extra expense.

Courtesy W F Berning

National Scale became one of the best-known commercial images in the Americas from the mid 1890s well into the early 1900s.[8] The penny scales appealed to nearly everyone. They were novel, intriguing, and fun. Baldwin's marketing genius made them readily accessible to thousands of people. The scales made a lot of manufacturers very rich, and they probably made the people who tended the routes even richer.

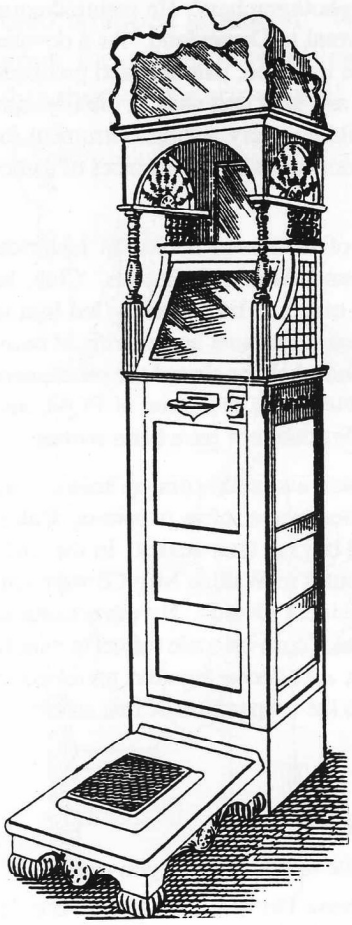


Chicago Recording Scale Company

Found in a storeroom when portions of Penn Station were being razed, this enormous ancient musical card-printing scale (Fig. 17) was put into Sotheby's auction of November 1979. The eventual owner, Rick Crandall of Ypsilanti Michigan, determined from markings on the machine, a printed weigh-ticket, and some papers stuffed inside the cabinet, that it was an early Musical Weighing Machine of 1894, made by the Chicago Recording Co. of Waukegan IL, and operated by the Manhattan Introduction Company. Armed with that information, Bueschel writes that he got thrown out of two libraries before finally locating the original records and photos of scale-maker Edward Amet and his scale, phonograph and moving picture products.

National Novelty Company

As stated above, companies started up in many places. In Minneapolis, MN, the National Novelty Co. [not to be confused with the other National companies] a maker of arcade machines, produced the National Weigher in 1899, another big-head lollipop scale, fig.19.



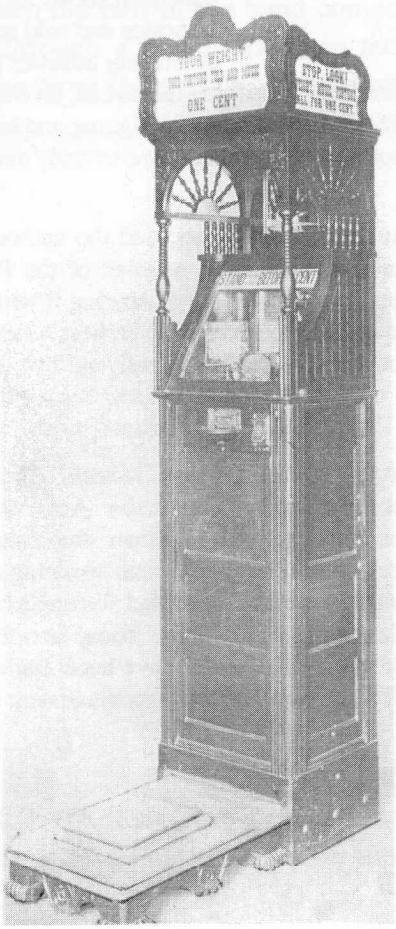
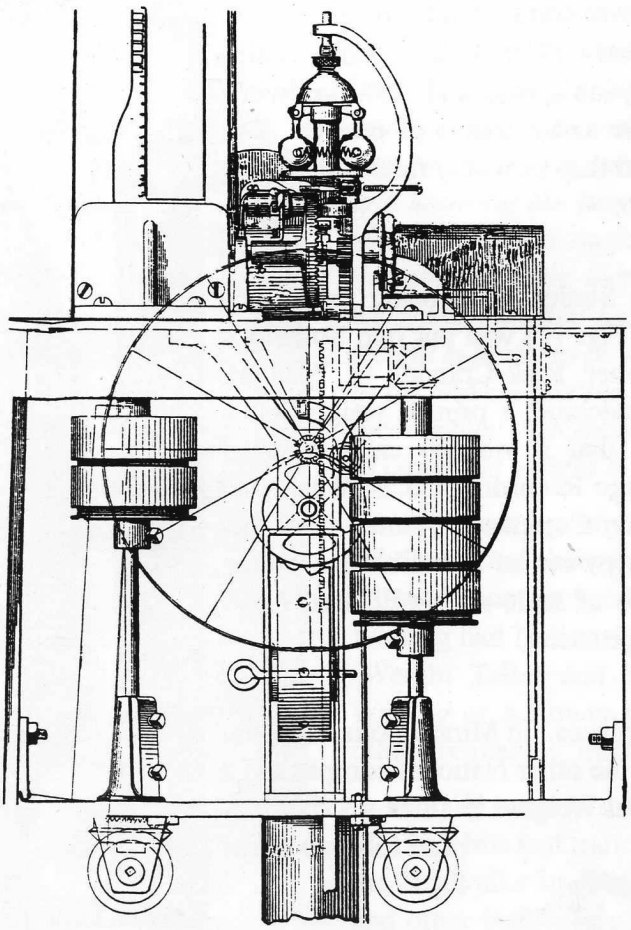


Fig. 19. ^^ National Novelty Round Column National Weigher,[9] the slim column having floral decoration cast into it.
Courtesy R Meade

Fig. 20. << Drawing from the UK patent no. 13,360 of 27 June 1899, taken out on behalf of "Leroy Wilbur Baldwin of No. 60 Murray Street, New York, gentleman"! He was really a hard-working accountant running the National Weighing Machine Company!

Fig. 21. << On the high marquee it announces on the front "YOUR WEIGHT YOUR FORTUNE TOLD AND MUSIC ALL FOR ONE CENT". On the side it shouts "STOP. LOOK! WEIGHT MUSIC FORTUNE ALL FOR ONE CENT". So it only cost a fifth of its competitor. Baldwin had a case that celebrated the skills of a wood-turner, with spindle-turned pillars holding up the canopy, and spindles filling in the sides. The wooden panelling made it unsuitable for exterior use, but such an ornate piece would have to be guarded anyway, so needed to be located indoors. Note the tiny pedestal on which the person stood.
Courtesy W F Berning



To finish off Part 1 with a choice scale, patented by Leroy Wilbur Baldwin himself in 1899, here (figs 20-22) is his equivalent to Chicago Recording Scale' Musical Weighing Machine.

Fig. 22. << Baldwin's Patent 13,360 of 1899. The interior was so interesting, it is difficult to understand why Baldwin only showed the top third to the user. The huge cylinders, hidden beneath a hip-high surface, contained springs to operate the ticket-punching mechanism and the musical-box. The user could watch the govenor flying round, and the music-box twanging, but the printing mechanism was out of sight. The springs were wound up by the action of the person standing on the platform. The musical box is not shown in detail [not being patented] but at top left is a revolving brass cylinder with spikes protruding from it, which twanged the metal comb on the left of the cylinder, as with any Swiss music box.

Biographies

Gerald E "Red" Meade began collecting scales while working as a repairman for the Toledo Scale Co. His enthusiasm for coin-op scales led him to amass one of the world's larget collections. To interest others in the hobby, he granted many interviews, made photographs available, and rented out his scales to movie-makers, television shows and photographers. He restored coin-op scales and sold several to Disneyland. As a devotee of amateur athletics he invented, patented and produced a device, the Tracmaster, that was used for testing and certifying the discus, javelin and shot putt used in the Olympic Games held in Canada and Russia. He was Head Weightmaster, designing and building every testing instrument for the 1994 Los Angeles Olympic Games. His spectacular collection was recently auctioned under the auspices of James D Julia Inc.

Richard M Bueschel was a fine historian, a dogged researcher, and the author of numerous books on historical technology. Although an aficionado of coin machines and a member of the Penny Arcade Collectors' Club, he collected only information, which he gathered for the sheer joy of sharing it with others. His ingenuity led him to several near-miraculous discoveries of the century-old records of the earliest American inventors and makers of coin-ops and also the business records of people active in the field as recently as1980. Bueschel has shared the excitement of his discoveries in several articles and two books, *Big Head Lollipop Scales*, reviewed in this issue of EQM, and *Collector's Guide to Vintage Coin Machines*. Without those publications, this article could not have been written.

William F Berning an active member of ISASC, studies, collects, restores, operates and sells coin-op scales. He contributed mightily to Bueschel's research for *Big Head Lollipop Scales*. As he started to specialize in coin-op scales, he tracked down old operators and former manufacturers, learning their stories and buying their scales. In the early 1980s he discovered that the coast-to-coast North and Central American operating routes of Watling Mfg Co were still in existence. After lengthy negotiation he bought the entire route and Watling's business records. By advertising in collectors' magazines he sold hundreds of scales all over the country. Today he operates coin-op scale routes in widely dispersed areas of the USA. He and his wife Jan wrote the attractive book *Scales, a collector's guide*, reviewed in EQM, 2392, and they both contributed graphics, information, and encouragement to the preparation of this article.

Notes and References

1 Private communication from R M Bueschel.

2 Editor - see page 2433 for drawings of Everitt's British patent no. 16,433 of 1884.

3 Editor - Can any member confirm that Howe made Everitt's patent? Please write to the editor if you can!

4 Bueschel, R M, *Big Head Lollipop Scales*, Coin-Op Classics Magazine, Handbook Division, 17844 Toiyabe St,

Fountain Valley, CA 92708, 1994, ISBN 1-885160-02-X, p 213.

5 Kerstiens, C L, *Coin Slot People*, Spring 1991.

6 Julia, James D, catalogue of Red Meade's collection, sold April 15, 16 & 17 1999, Fairfield ME 09437.

7 Berning, W F & J, *Scales a collector's guide*, Schiffer Publishing Ltd, 4880 Lower Valley Road, Atglen, PA 19310, 1999, ISBN 0-7643-0778-9, page 92.

8 Meyer, R K, *The American Weigh, Vintage Penny Weighing Machines from the Collection of Christopher Steele*, The Taft Museum, Cincinnati, Ohio, catalogue of Nov 18 1983-Jan 8 1984.

9 Bueschel, R M, *Collector's Guide to Vintage Coin Machines*, Schiffer Publishing Ltd, 4880 Lower Valley Road, Atglen, PA 19310, 1995, ISBN 0-88740-736-6, p 185.

Part 2 will be in the next issue.

Everitt's Patents, 1884 & 1889

BY W AIRY

This description was written in Airy's paper *On Weighing Machines*, given to the Institution of Civil Engineers 12 Jan 1892. It describes the first patent of 1884, with the modifications to the coin box patented in 1889.

"This diagram [Everitt's patent] shows part of the interior of an automatic weighing machine, such as are found at most railway stations, &c. The weight of the person standing upon the platform is transferred by the levers of an ordinary platform machine to the vertical steel band which is wrapped round an arbor on the axle of the disc wheel, to which is rigidly attached the toothed segment. The weight is rigidly attached to the axle of the wheel by means of a cord wrapped around it. When the pull of the band comes upon the wheel it revolves through a certain angle in the direction of the arrow until the three forces, viz., the pull on

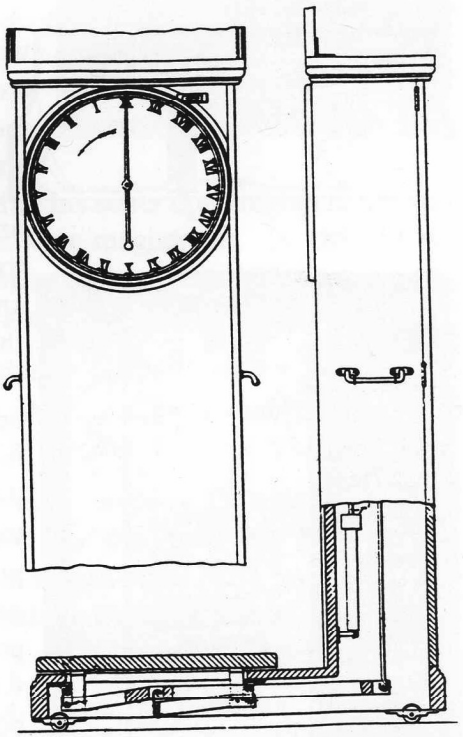


Fig. 1. AA Everitt's patent drawing no. 16,433 of 13 Dec 1884. Who would think that this tedious box contained the makings of a revolution in the weighing habits of Europe and America? The original design had the pointer going counter-clockwise.

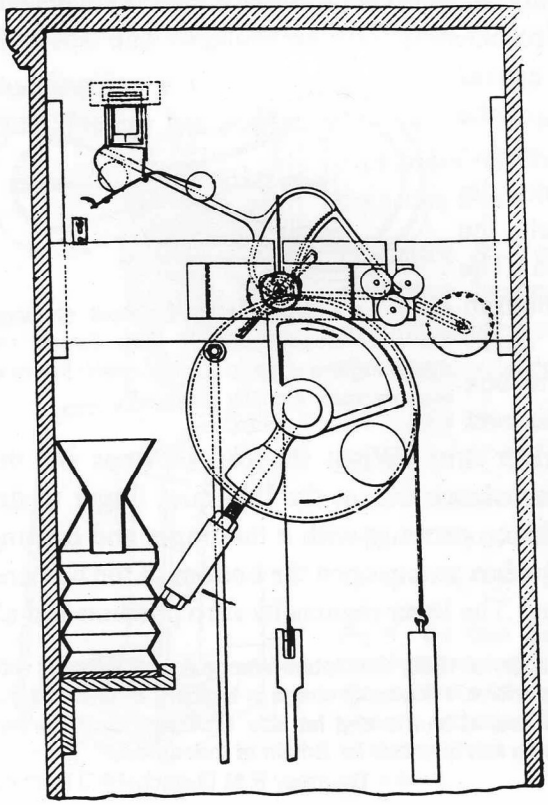


Fig. 2. << Everitt's patent of 1884. As Airy explains, the person stands on the machine and the weighing occurs immediately. But the pointer is not turned until a coin is dropped in.

Note that Everitt had the heavier poise on the right side of the disc wheel, and the lighter poise, an adjustable pendulum poise sticking out to the left, so the pendulous poise swings down to the bottom when a person stands on the platform. He considered the possible jarring and included a damper for the disc wheel and a governor for the pointer.

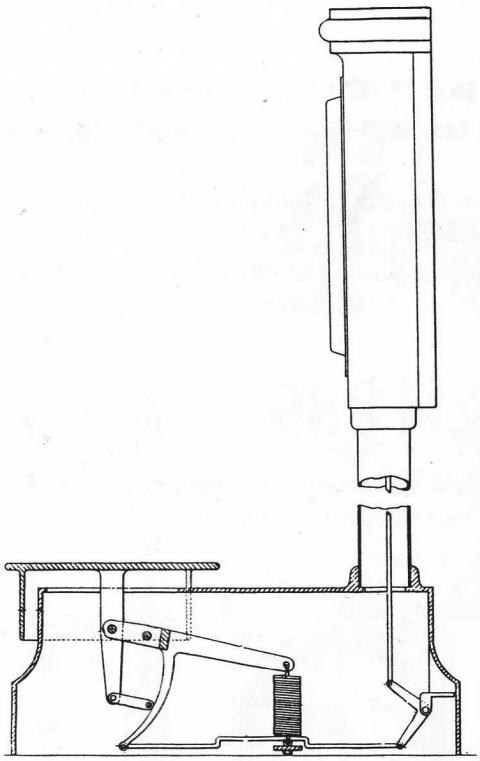


Fig. 3. ≺≺ Everitt's patent no. 13,260 of 22 Aug 1889. He shows a spring resistant under the platform, with no part of the weighing mechanism in the head. This could not be patented, but suggests a major change in basic design.

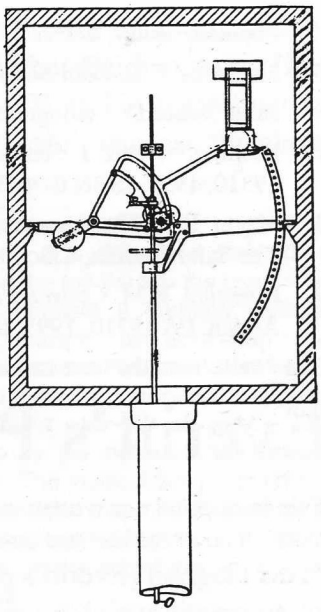


Fig. 4. ⩓⩓ Everitt's patent no. 13,260 of 22 Aug 1889. This patent was for a minor adjustment to the coin mechanism. Note that the shape of the casing implies a big head on a column.

the steel band, the weight and the counterbalance are in equilibrium. The toothed segment actuates the pinion which carries the [oblique] finger and this finger remains fixed in position as long as the person is standing on the platform.

If now a small weight, as a penny, be passed through the slot, it falls into the small box and causes the lever to turn; the lever, which turns in friction wheels [near its right-hand end] and is counter-balanced, carries a toothed segment which actuates a small pinion on the same axle as the pinion and free to turn on that axle by a sleeve. This small pinion carries a finger which is arranged to catch against the [oblique] finger when it moves up to it. Consequently as the lever turns, the finger revolves and is stopped when it reaches the [oblique] finger. The sleeve of the pinion which carries the finger also carries the pointer, and if the dial is properly graduated its pointer will indicate the weight of the person. The box has a hinged bottom with a projecting click-finger which, as the box descends, plays idle over the staves of a ladder arc. When the person steps off the platform, the counterbalance causes the [oblique] finger to run back to its zero position, carrying with it the finger and causing the click-finger of the box to trip open the bottom of the box and let the penny fall out. The lever regains its zero position and all

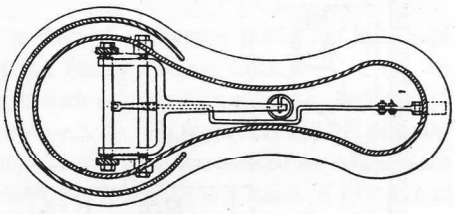


Fig. 5. ⩓⩓ Everitt's 1889 patent, showing his new elegant base. Was Everitt redesigning the case to compete with the new manufacturer's smart designs?

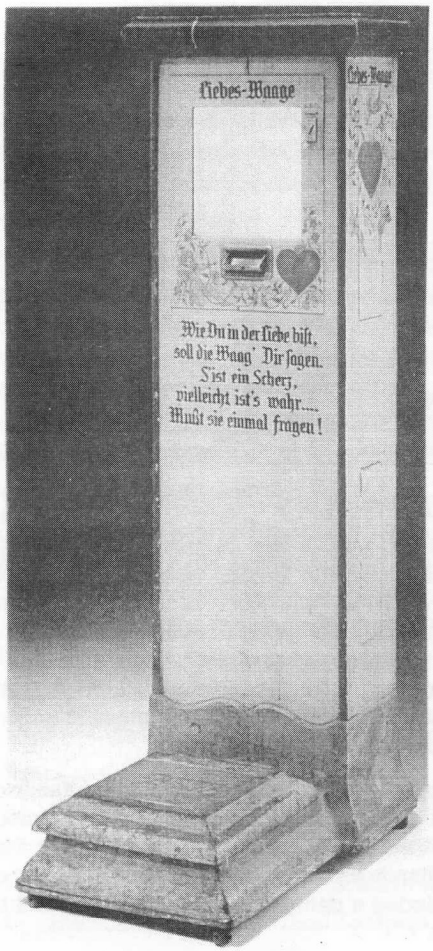


Fig. 6. ≺≺ A German scale of 1889, the Liebes-Waage [Lover's Scale] with "Everitt patent" on the platform. The boxy shape is typically Everitt, but the lively yellow cover with scarlet hearts and fat little Eros with his bow and arrow ready to shoot, is far too frivolous for Britain at that time.
Courtesy R M Bueschel & J Berning

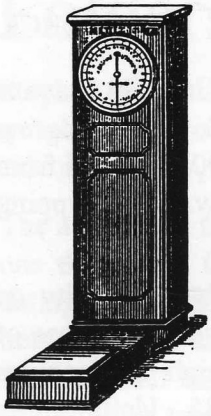


Fig. 7. ≺≺ A picture from a page of French scales, printed c.1888. No details were included with the pictures, but this does look like an Everitt patent. The name of the company is almost illegible, but is possibly METTEZ & Cie.

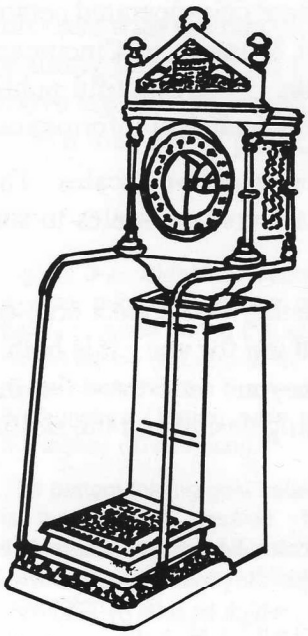
Fig. 8. ≻≻ This illustration from a French journal of 1889 shows a typical Everitt patent scale with French writing showing clearly "Bascule Auto..." and "POIDS E..." The pointer goes round clockwise, starting from the bottom, so that the graduation for 65kilos is at the top. Note that the scale is taller than the man in his top-hat. Courtesy R M Bueschel

is ready for another weighing. Since so small a weight as a penny has to move the lever together with the dial finger &c. it is evident that the workmanship must be good and the friction kept very low by means of friction-wheels."

Editor - Percival Everitt was a buccaneering entrepreneur. Although a young man (born in 1856) he is thought to have started two companies making coin-operated vending machines, both of which he sold before he thought of his person scales in 1884. Perhaps he enjoyed the freedom available in London, after his sober up-bringing in the quiet countryside near Fakenham, Norfolk, where both his parents were magistrates. In 1881 he was boarding in the house of an actress in London; a frivolous bachelor perhaps? By 1885 he had sailed the Atlantic and persuaded E & T Fairbanks to produce his patent scale.

A German company manufactured his scales with a romantically painted exterior. The picture shows no dial or window by which to read the weight, but has a slot, presumably for a ticket, perhaps with some sentence relating to the future of the lovers. See fig. 6.

Judging by a small drawing, Everitt also persuaded a French company [Mettez & Cie?] to manufacture his scales. See fig. 7. It is said that SAFAA [Société Anonyme Française des Appareils Automatiques] 75 Rue la Condamine, Paris, were makers of coin-ops since 1885. Were they making Everitt's patent?



G Salter & Co did made scales to Everitt's patent, no catalogue evidence being available, but a surviving example showing the graduations painted round the circumferenceof a clear glass dial, so that the user could enjoy -watch the upper machinery operating.

By 1889 Everitt called himself an engineer in his patent application, living at 47 Cannon Street, London. Of course, to apply for a British patent, it was sensible to give a British address, and there is no reason why he shouldn't have been living most of the time in the United States, receiving money from his various coin-op machines there.

Fig. 9. ≺≺ Geo. Salter & Co made this huge cast-iron scale with EVERITT'S PATENT cast into the platform. The pointer went clockwise, but starting from the bottom of the dial, so that a 10 stone (140lb, 63.6k) person would have the pointer nearest their face when it indicated their weight. [Warning - because this sketch was taken from a photocopy of a poor photograph taken in dire circumstances, the details may be erroneous.] Courtesy C Kinmonth & Conway Valley Railway Museum.

Review

BY J STORCK

Big Head Lollipop Scales by R M (Dick) Bueschel, Fountain Valley CA 92708, Coin-Op Classics Magazine, Handbooks Division, 1995. Soft cover, 240 pages, 240 illustrations, many showing multiple detailed drawings on one page, all black and white. Available for $45.00 post-paid from W F Berning, 135 W. Main Street, Genoa IL 60135, iweighu@chicago.avenew.com Shipping charges on overseas orders to be arranged, preferably by email.

By any standard, this is a remarkable book. Dick Bueschel, a widely published authority on historical technology, has approached his subject from every angle with zest and vibrant use of language. Lollipops were a special adaptation of the coin-operated Automatic Weighing Machines that first appeared in Europe in the early 1880s and in the United States in 1885. Unlike other types, these were designed for outdoor use wherever people congregated: on sidewalks in the downtown areas of cities and towns, in parks and on public beaches all over the country. To most Americans "over a certain age" they are an important childhood recollection.

The first chapter, How to Maintain Your Lollipop Scale, has useful tips and answers some of the questions asked most often. The best part of the book for me is the history of all the major coin-op scale companies and a few lesser-known ones, eighteen in all. Sixteen of them began by making other automatic vending machines, but the coin-op person scales soon became their most profitable items. Most companies are arranged in chronological order by starting date. There is also a listing of more than 100 Lollipop scales with the date that each was first produced.

There are dozens of illustrations; sales and promotional flyers, on-location photos, manuals and (Dick's favourite) patent drawings. The drawings range in complexity from two to six sheets for most models to eighteen sheets for the most complicated Big Head ever made, Rhodes Hochriem's Lollipop Printing Scale. For the benefit of anyone wanting additional technical information there are instructions for ordering entire patents.

In order to collect anything you need information, and with the passing of Ray Farr, Gerald "Red" Meade, and Dick Bueschel, we are losing our most knowledgeable sources for the history of coin-operated scales. Unfortunately Dick Bueschel's plans for a follow-up book on the other types of coin-ops were not realized before he passed away. The only other book about coin-operated person scales is *The American Weigh*, which portrays an exhibition at the Taft Museum in Cincinnati, Ohio, of vintage coin-op scales from the collection of Christopher Steele. That beautiful publication includes colour photos of additional types of coin-ops, but very little technical information.

The recent auctions of Red Meade's collection have stepped up the interest in coin-op scales. The prices realized ranged from $100.00 to $25,875.00, showing that there are coin-op scales to suit everybody's pocket book.

Probably, a lot of new owners will be ordering copies of this book. Whether you collect coin-op scales or are just interested in scales in general, the book will have something for you. It is both a comprehensive manual for collectors and a good read for almost anyone interested in the beginnings of the commercial age with its increasing emphasis on appealing design and the skilful use of promotional ideas to get people to part with their pennies.

Author's Biography

Jeffrey Storck began collecting scales about 18 years ago. Beginning with small shop scales, he was soon charmed by coin-operated scales. He now owns about 400 of them including sixty or seventy lollipops. He produces an assortment of replacement scale faces and scale glass for some of the more common coin-op scales , which he sells by mail order.

Folders how wide?

FROM N & J SCARRATT

Stephen Houghton & Son made an exceptionally wide-bodied box for a folding gold balance for weighing sovereigns and half-sovereigns. The central part is of standard width, but the blocks each side make it 3⅝ inches (91mm) wide.

The address on the label is the briefest one they used, ORMSKIRK only, so dating this scale is only possible to between 1824 and 1853. The father, Stephen, and his son, James, worked in Ormskirk together from 1824 until James (still using the trade name of Stephen Houghton & Son until then, despite the death of his father in 1839) moved to Scotland Road, Liverpool in c.1853, at which point he changed the trade name to James Houghton.

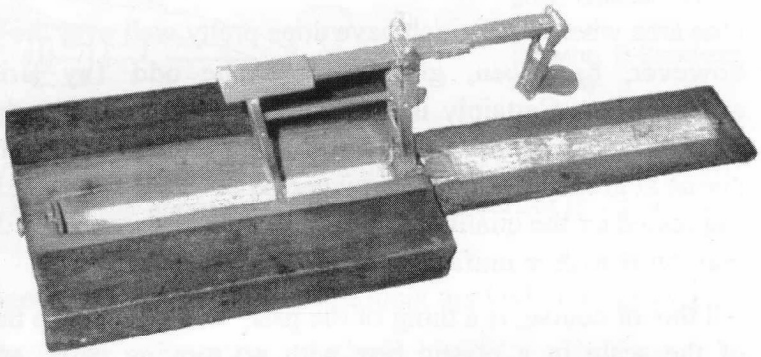


Fig. 1. ^^ Stephen Houghton & Son folding gold balance for the sovereign and half-sovereign only. Made between 1824 and 1853. The two blocks on each side of the folder have no function other than the prevention of the tipping over of the folder. Courtesy N Scarratt

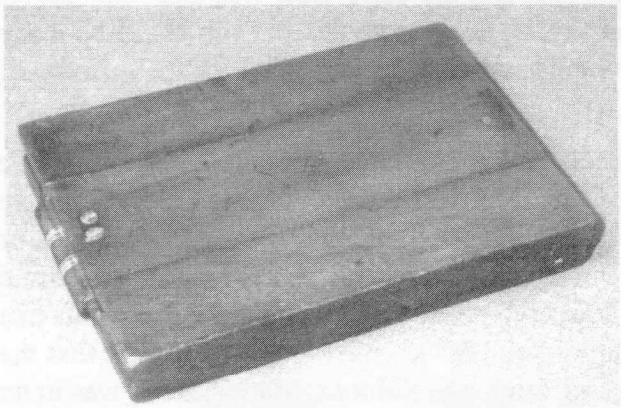


Fig. 2. << Mahogany box 35/8 inches (91mm) wide. About 5½ins (140mm) long. Courtesy N Scarratt

As this folder was for the sovereign and its half only, it was probably made after 1835 when guineas were no longer encountered, so a scale buyer would only expect to weigh sovereigns.

Editor - Another wide-cased folder for the sovereign and its half appeared on the market recently, also made by *Stephen Houghton & Son, 142 Scotland Road, LIVERPOOL* LATE OF ORMSKIRK, so made in fact by James Houghton. After making the neat example above, why did Houghton make this case with the two side blocks slightly shorter and slightly narrower than the folder itself? The resulting box is 5½ ins (137mm) long (with blocks 4.8ins long), and 3ins (75mm) wide. The two above are the only recorded examples of cases extended by blocks. They are still small enough to fit in a man's coat pocket but are somewhat cumbersome.

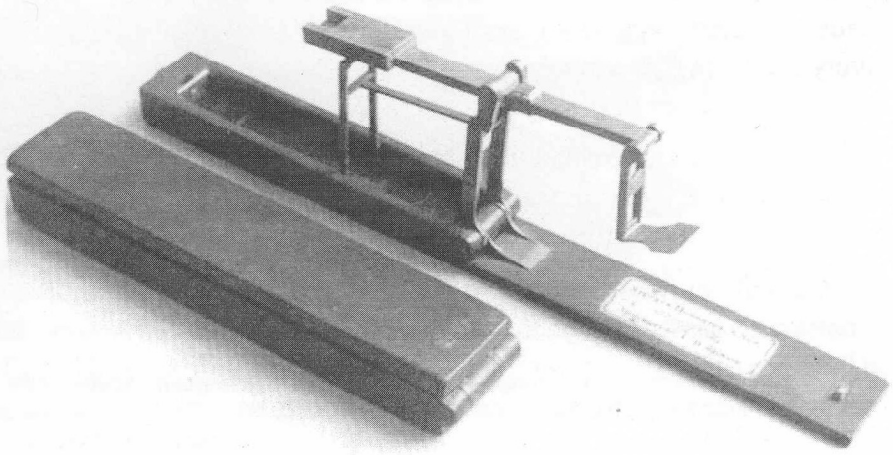


Fig. 3. >> Stephen Houghton & Son miniature folding gold balance, made during the same period as the one above, for the same coins, but the box is only 8/10 inches (19mm) wide and 3.8 inches (97mm) long.

The bottom folding gold balance is the standard version, 1ins (24mm) wide and 5½ins (140 mm) long, made by Stephen Houghton.

Photo M A Crawforth

Vive la Différence

BY J KNIGHTS

When it comes to patriotism, I have to confess that I usually side with Dr Johnson, who dismissed it as being the *"last refuge of the scoundrel"*. That which is bad, does not suddenly become good, simply because it is ours.

One area where the British have done pretty well over the years, however, has been, give or take the odd Tay Bridge,[1] engineering. Certainly in the case of late 19th and early 20th century weighing machines, whose entrails I was constrained to divine at great length during my period of training, I was always impressed by the quality and ingenuity of the component design that the British manufacturers used in their equipment.

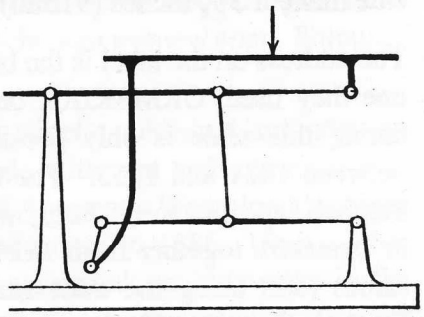


Fig. 1. AA Béranger invented his double-beam system in 1845. When was the single beam version introduced?.

All this of course, is a thing of the past. We now live in the age of the scale in a plastic box with no moving parts, and an expected life of about five years, which can be made anywhere in the world with little to distinguish one from another.

One can however, take pride in the products of the past and my early view was that 'our' scales were far better than all that 'foreign' stuff. In particular, favourable comparison could be made with equipment made in other parts of Europe, which internally lacked much of the refinement found routinely in the British models.

It was possible to concede, through gritted teeth, that some of the Continental patterns did have the edge aesthetically, on the solid, if slightly dull, outputs of the British makers, be they simple Roberval or Béranger counter machines with their Art Nouveau or mock Baroque ironwork, or more complex self- and semi-self indicators with the slightly more stylish sweep to the curves and the Rococo-like disregard for symmetry (there is an amazing Belgian one that has the weights pan offset by 90° so that the machine appears to be an impossible "L" shape). One suspects that the "worthy" nature of the machines produced by Messrs Vandome, Siddons, Mattocks etc, was in no small measure dictated by the Board of Trade approvals system within which anything as frivolous as a balance indicator shaped like a bird's beak, would have been regarded with deepest suspicion.

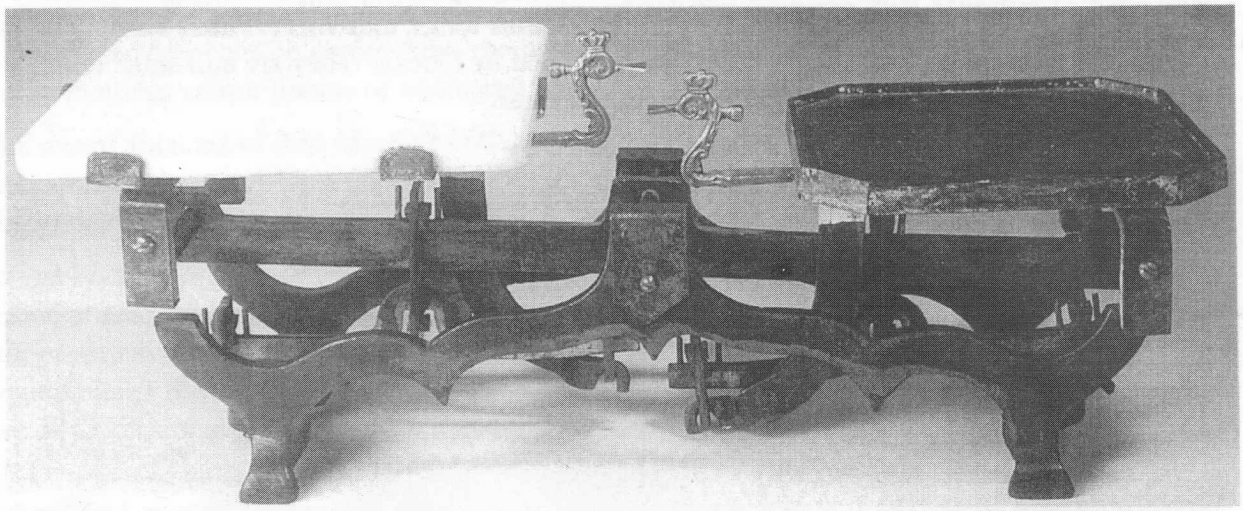


Fig. 2. AA An anonymous Béranger counter scale with rectangular ceramic plate. Not only is the frame nicely curved, but the two indicating birds have neat crowns and are gilded. The two little pins drifted into the beam show clearly on the left-hand end. Courtesy Il Museo della Bilancia a Campogalliano, Inv. 201

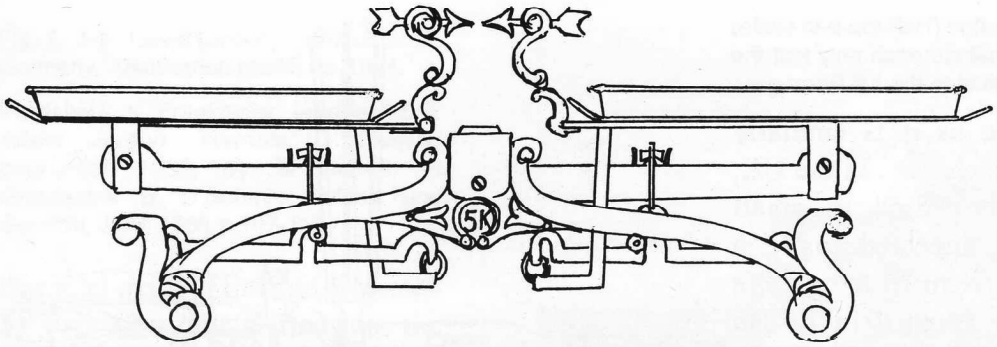


Fig. 3. ≪ Another relatively plain, anonymous Béranger counter scale. Brass pans. Iron frame. Painted green and gold. Quarter size.

Drawing D Crawforth-Hitchins

As time has passed however, and the opportunity has arisen to examine more of these Continental patterns in the course of collecting, it has become apparent that perhaps the earlier low opinion of the mechanism within the shell needs to be re-appraised.

The differences between UK and Continental equipment is perhaps most marked in the case of the Béranger counter machine.

In the days when non-self indicating counter machines were in common use, most equipment of the kind in the UK was made on one or other variations of the Roberval principle, with only the odd subsidiary lever type popping up in specialist areas, where the comparatively high level of sensitivity was deemed to be worth the extra cost.

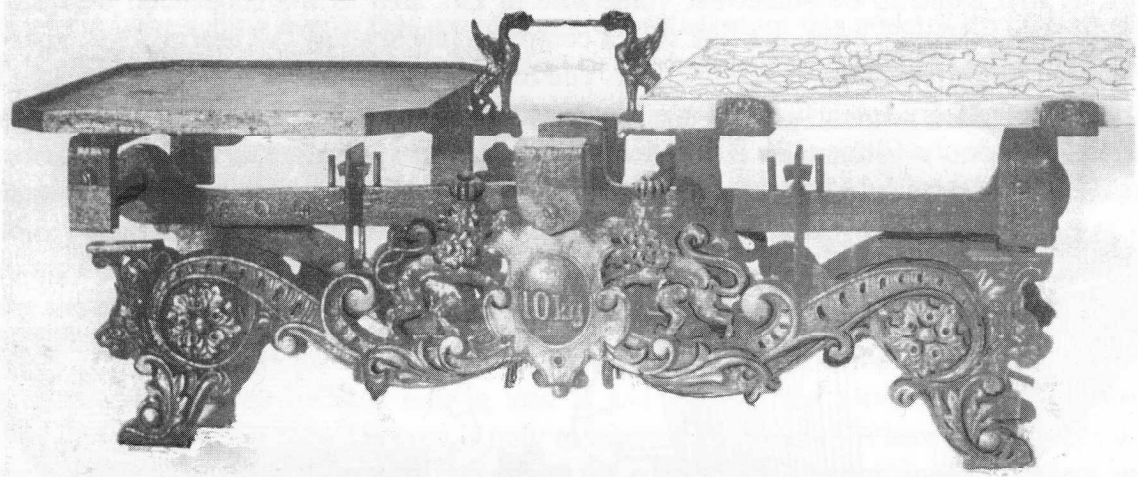


Fig. 4. ^^ A magnificently ornate variation, yet again anonymous, but at least this one has verification marks for the Schwabach area of Germany. Note the beaked dragons and the crowned lion supporters.
From Baierisch Gemessen, Gewogen und Geeicht by J Schlender, *Mass und Gewicht*, Dec 1993

In most countries of Europe however, one tended to see a Béranger on every market stall and in all manner of shops selling basic commodities that would never have got near so complex a piece of equipment in the UK. It is still one of the joys of foreign travel to observe that, even today, the mania for electronic equipment, so prevalent in this country, has not yet quite swamped the Continent, where some people still seem able to conduct their transactions on traditional instruments.

The scale that one sees on the market stalls of Europe is a different beast from the British Beranger in its little wooden overcoat or heavy iron case.

It sits instead in a delicately cast, iron frame with all the working parts exposed to view through the tracery. Where the boxed version has a double beam with the subsidiary levers connected to cross members by links, the Euro-Béranger is a single beamed creature with long knife edges. The intermediate pull from the lower lever is transmitted, via a knife-edge sitting between the terminal knife and the fulcrum. This single beam construction is a feature that one always associated with

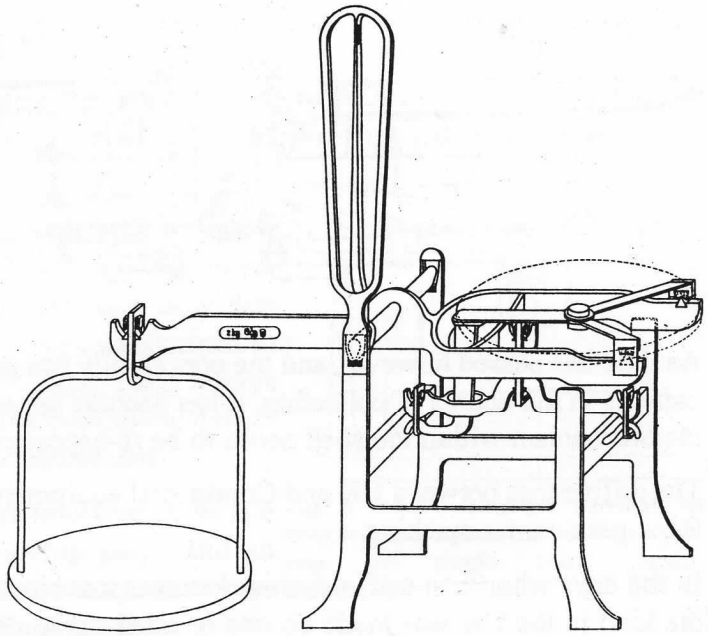


Fig. 5. ➢➢ Halboberschalige (Half-top-pan scale) Wage System B. Note that although only half the linkage is used, it is identical to the full Béranger.

the continental scale as it is similarly found in Roberval machines. In the UK, it was usually only found in small capacity scales and appeared to be a somewhat inferior system to the double or bifurcated beams adopted in British machines over about 4 lb capacity.

A prerequisite of any trade scale is that those bits that need to be connected, stay connected, despite the normal rigours of use and transportation.

The subsidiary lever machine has somewhat more live linkages than the Roberval and so the protection of these points from inadvertent dislocation, is of course, vitally important. The Continental machine appears, at first sight, to be somewhat vulnerable in this area as the connection between the subsidiary lever and main beam is a link with a comparatively shallow 'V' bearing that appears to sit somewhat precariously on the knife edge. The lower end of the link is securely located in a crook in the subsidiary lever, but one wonders how the top connection survived being bounced around in the back of a Citroen van or whatever means of rural transport was used to go to market. Where the UK maker would have used a closed link or a capped bearing, this type of machine has

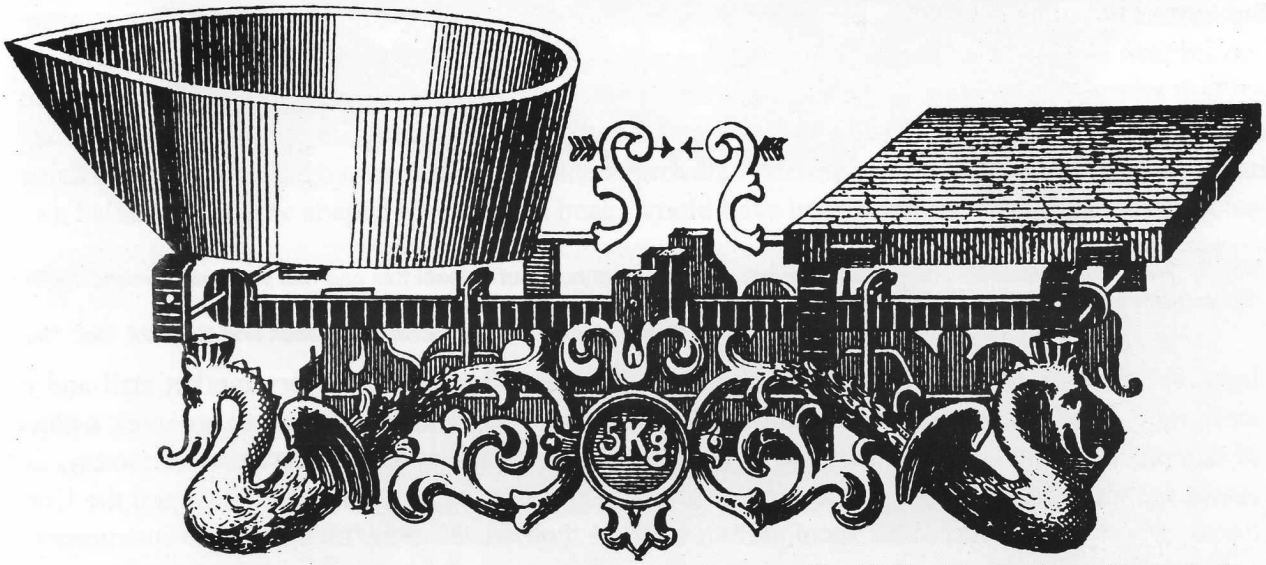


Fig. 6. ⩓⩓ Barmer Waagenfabrik, owner C Aug. Freudewald, Barmen. The 1907 catalogue shows this confection available in capacities 1, 3, 5, 10, 15 20 or 25 kilos. Note that, although the company specialised in making these Béranger scales, and made only four frame designs, they didn't include their name or logo within the frame design. Weren't they proud of their frivolous scale?
A photo of this very scale is shown in *Mass und Gewicht*, 1989, p 254, fig. 2, labelled as "Manufacturer? German" So even the knowledgeable Herbert Griesshaber did not know who made it until the catalogue turned up recently. His article is illustrated with 21 single beam Béranger scales, yet only 7 have either trade mark or name by which to identify the maker. They are Andreas Bizer, Pentru Bucatarie with intertwined TW, intertwined HF, another Andreas Bizer, Ernst Hauth, KFS [Kuhn Freres Saone], and another Andeas Bizer. And Griesshaber identifies 17 of them as German. See Das Waagen-System von Joseph Béranger, *Mass und Gewicht* December 1989, p 245-257,

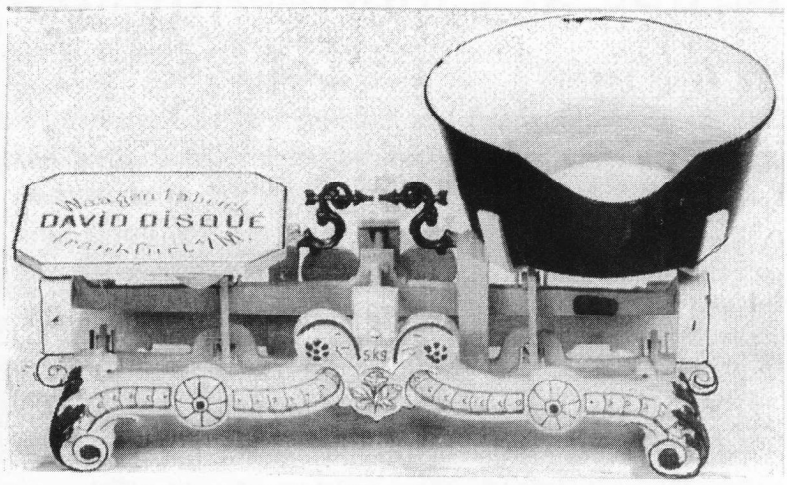


Fig. 7. ➢➢ David Disqué, Frankfurt a/ M, Germany. Verification marks for 1914.

Published in *Frankfurter Waagenfabrik Albert Jordan, vormals D Disque, gegrundet 1838*, by M Danell, H Grieshaber & D Schmitz, *Mass und Gewicht*, June 1988 p 107-118.

this vital point of linkage protected by two little pins drifted into the beam on either side of the knife edge (see figs. 2-4). It looks totally inadequate but it has to be conceded that, contrary to appearance, it is actually quite difficult to remove the bearing from the knife edge. It also has to be admitted that this apparently crude system has to be installed with some precision, so as to provide the necessary retention without there being a risk of binding when the machine is being used.

Of course, it is not necessary to go abroad to see this type of machine these days, as some of them are coming over here and appearing at antique sales and fairs. I recently came upon such a scale at one of the large selling events that we now get, in profusion, in this country, and which attract all manner of merchandise from the highly select to the downright dubious.

My own preference is to wander the 'outfield' of such an event where the dealers are wild and hairy, and the writ of LAPADA does not run. Here one finds all manner of unconsidered junk, amongst which, there sometimes nestles a pearl, such as a Continental Béranger of the type previously described. It has to be wondered how such an exotic item, from far-flung shores, ends up amongst an otherwise unprepossessing pile of detritus, but experience shows it is a mistake to enquire too deeply.

Whatever reservations can be expressed about the 'build quality' of these machines, it does have to be conceded that they are very nice to look at and one can see why dealers would deem it worthwhile to offer them for sale, even if only to interior decorators. Where most people would not happily display a stove-enamelled two pound fan-scale in their lounge, many I suspect, would quite like to stand their potted plants in the pans of a scale displaying this degree of totally unnecessary, but pleasing, ornamentation.

For my own part, such a device reinforces my view that weighing, although superficially a universal and perhaps mundane requirement of commerce and experiment; was once an activity carried out with full expression of the cultural variation that was so much a part of the human condition; but which is, sadly, being rapidly eroded by the wonders of modern technology.

Notes & References

1 The Tay railway Bridge over the dangerous Firth of Tay collapsed under the weight of a passenger train. On enquiry it was found that the castings were full of holes that had been filled with rubbish and disguised.

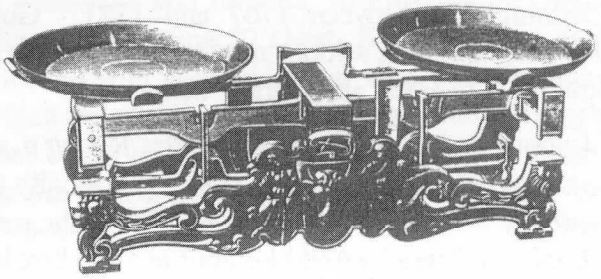
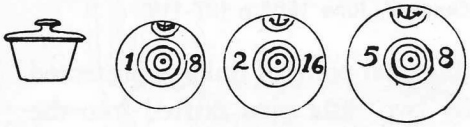


Fig. 8. ➢➢ L Roche (A & M) C Reiss succr. Q couronne, 4 Rue de la Ferronnerie, Paris 1er. Extra rugged "55 Speciale". After 1913. From *Le Système métrique*, 690.

Notes & Queries

N & Q no. 144 — FROM A ATTWOOD

I have an oval-japanned box holding a small hand-held beam signed PRATT. There are three weights with numbers that bear no relationship to their mass, (2.1g, 4.2g, and 8.4g respectively). Each bears a faint stamp which I interpret as an anchor, which might be a scruple sign. Please can you throw light on the meaning of the numbers and the stamps on the weights? It would be interesting to learn about PRATT.



N & Q no. 144 — Reply from the Editor

After 1774 the British Government called in as many dilapidated gold coins as they could (whether English or Portuguese) and recoined them into guineas and half-guineas. Because criminals counterfeited, trimmed or sweated bits of gold off the coins, most people needed to know the buying power of any gold coin that they obtained. They had a set of scales (costing between 5/- and 10/6, on average) and checked the coin using weights like yours. The lowest permitted weight for a guinea after 1776 was 5 pennyweights 8 grains. Any lower and negotiations started. If it was the taxman they were paying, no way would he accept a light guinea. If it was the tailor they were paying, he'd check the coin and agree to allowing £1 and tuppence, or whatever, on that coin. Then they had to make up the difference with silver or copper coins. Similarly, the half-guinea was supposed to weigh not less than 2 pennyweights 16 grains. (The maths is easy once you know that 24 grains make one pennyweight.) The quarter-guinea was only minted in 1762, in small numbers, and proved to be such an irritating little coin, so thin and small that people easily lost it, that the Authorities stopped minting it. However, for the sake of completeness, many coin scales provided the facility to weigh it, hence your 1 pennyweight 8 grains.

Officially, the Assay Offices did not have to check the accuracy of coin weights, but sometimes the Tower Mint did in London (putting a nice crown on each), the Assay Office in Birmingham (a little anchor), or in Edinburgh, (a thistle).

Just because the Recoinage had taken place, that didn't mean that all old coins came out from under the floorboards, so scale-makers continued to supply weights if requested for the eleven gold coins (current in England between about 1730 and 1775) for the £3/12/0, the 36/-, the 27/-, the 21/- the 18/-, the 13/6, the 10/6, the 9/-, the 6/9, the 5/3 and the 4/6. The 21/-, 10/6 and 5/3 were English; the others were Portuguese, called the Johannes (Joey) the moidore and their divisions.

Oval japanned boxes which retain their label are rare. Pratt's work is rare. Only three scales with PRATT stamped on the shears are known. There is a suspicion that Pratt made a few other scales with entwined JP on the label, or possibly the ones with J*P on the label. But first we'd have to prove that your Pratt had a first name starting with a J. One possible candidate is Josiah Pratt, steel toy-maker and plater of Steelhouse Lane, Birmingham, and subsequently of 27 Cannon Street, Birmingham, between 1767 and 1781. Good dates. Right town. Suitable trade, in that Birmingham men seldom specialised totally as scale-makers. A toy-maker made any little gadgets and tools of steel, as the trade demanded.

If your box is dull, you might (after testing a corner) rub it gently with Brasso then buff on pure wax to preserve the sheen. They are normally tatty, but originally they were the top of the market, with the best steel beams in them. When the rosy silk gleamed, the green baize was fluffy, the steel shone, the brass looked like gold and the box imitated tortoiseshell, it was joyous.

Excelente Coin-weight

BY N BIGGS & P WITHERS

A remarkable coin-weight

By 1556 the amount of dubious coin in circulation was so great that a proclamation was issued encouraging people not only to check their coins by weighing them, but also to deface any that were counterfeit.

However, recent work has pointed to the lack of examples of coin-weights produced in England at this time. Although there are numerous coin-weights which appear to date from the early part of the 16th Century, very few can be assigned to the years after 1526. Indeed, it is quite possible that the use of coin-weights was officially discouraged at the time when the coinage was being manipulated for the King's profit.

However a remarkable weight, which can be firmly assigned to the 1550s, has recently turned up. It is square, made of brass, weighs 3.5g and the obverse has the characteristic "two faces" design of the Spanish ducat. This obverse design is fairly common on weights made in the Low Countries, France and other parts of the Continent, and such weights have been found in many parts of England including Leeds, Lincoln, London, Winchester and Cornwall.

The unique and distinctive feature of the weight is that the reverse carries the value of the excelente in English money: VIS VIIID. A further point of interest is that the reverse of the weight is from the same die as another unique piece, first described by Crowther-Beynon and listed as Number 327 in the *Corpus of British Coin-Weights*. This bears the design of the 15th Century Henry-noble on its obverse, and its current value is VIS VIIID on the reverse. It should be noted that, although the noble minted from 1412 to 1464 had originally been valued at 6s. 8d., by the 1550s its value had doubled, so Number 327 is actually a weight *for a half-noble*, as is confirmed by its weight of 4.37g. The ducat and half-noble were both coined from nominally pure gold, and their official weights were almost exactly the same, so the common valuation of 6s. 8d. is consistent.

Thus we now have evidence of a small output of coin-weights specifically for the English market in the 1550s, and that the weights were made in the Low Countries. The scarcity of these pieces probably reflects the fact that the circulating medium was simplified in the early years of Elizabeth. As part of this process, a proclamation of 1561 decreed that the only legal foreign coin was to be the crown (French, Flemish or Burgundian). Thus the weight shown above would have been used for a few years only. Even so, it is likely that weights for those coins mentioned in the second 1554 proclamation exist and perhaps others too.

The Spanish Excelente in England

On 25th July 1554 Philip of Spain, descendant of Ferdinand and Isabella, was married to Queen Mary of England. He brought with him a vast treasure, including 27 chests full of bullion, each being over a yard long; 99 horses, and two carts loaded with gold and silver coin. This treasure was part of a complex financial arrangement, in which the marriage was merely a factor. Preparations had been going on for some time, and included a mission to Spain by Sir Thomas Gresham, who had been given detailed instructions on how the treasure was to be conveyed. The Privy Council had accepted that there would be a large amount of foreign coin and that this would pass into circulation in England.

The use of alien coin was nothing new, and indeed proclamations fixing the value of foreign coins in England had been made periodically since 1522. Proclamations relevant to the Spanish treasure were made in 1554. On the fourth of March it was proclaimed that the French *écu au soleil* should pass for six shillings and fourpence. On the eighth of March the Queen's printer was ordered to desist from *prynting or uttering* this proclamation, and to replace it with a more detailed one. Among the coins tariffed in the second proclamation were the French crown, some Spanish silver coins, and the "double ducat of Spain with two faces" at thirteen shillings and fourpence, and the *single ducat of Spain with two faces* at six shillings and eightpence. The last two were the English names for the double and single *excelente* of Ferdinand and Isabella, coined from 1497 onwards. The excelente conformed to the accepted ducat-standard, 3.5g of nominally pure gold.

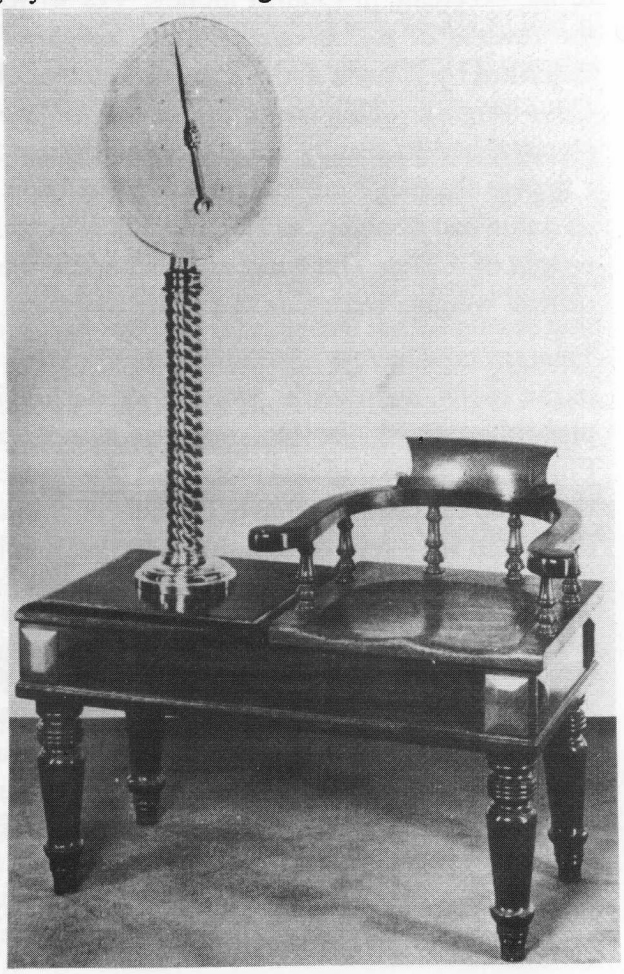
Dr. Challis quotes some general evidence that Spanish ducats did circulate in England in the reign of Philip and Mary. This may be supplemented by recorded observations of the activities of the felons of the time. On 18th August 1554 at Winchester, Anthony Craddock stole two pieces of gold called *duble ducketts of gold* of the value of 26s. 8d. On 18 October at Deal, two ruffians *stole a leather bag (price 2d.) with 20£. 5s. in money*; the money included a large number of foreign pieces, including *a gold piece called a duble duckett*. It is clear that the foreign pieces attracted the attention of forgers as well as thieves, because later in 1554 Parliament reiterated its existing sanctions against the counterfeiting of coin, and also made it an offence to import any counterfeit foreign coin.

With grateful thanks to Tom Wood for lending his weight. First published in Spink's *Numismatic Circular* in February 1995, and re-published with their consent. Amended slightly by the authors in the light of new evidence.

Writers' biography:
Bente (Danish) and Paul (Welsh) Withers work together, running Galata Print, selling all things associated with coins, medals, tokens and weights. Having printed their own catalogue for many years, they have expanded to being printers for other authors (such as Norman Biggs). Their interest in weights lead to their extensive travels in search of coin-weights, which they recorded in exemplary detail. This resulted in their superb book *British Coin-weights*, with its thousands of photographs taken by Paul. With Bente's phenomenal memory for designs and punctilious note-taking, they make a formidable team, even though they say the weights are just a hobby for them! Well, Paul is known for his sense of humour!

Norman Biggs, a professor of mathematics, is equally renowned for his intense involvement in his hobby - the study of and publication about British weights, for trade, bullion, apothecaries, etc, and about their verification marks. His discussions with Dr. Allan Simpson and Professor Robin Connor led to the re-evaluation of the British Mediaeval pound and its sub-divisions, and its relationship with the various continental pounds.

Showcase



Geo Salter & Co. 1877 personal weighing machine for a gentleman's club. Private collection.

For Silver or Gold Dollars?

BY J KATZ

The weights for U.S. dollars, shown on EQM 2402, interested me. I have such a set of weights. Were these weights intended to establish the weight of dollars, as is stamped on the weights, or were they intended to weigh bullion? My set is stamped, in place of the "U.S.", with "F & S" on the 4, 5 and 10 dollars; and with just "FS" on the 1, 2 and 3. I also have matching grain weights denominated 20, 30 and 50 with "F & S" stamped thereon. Can anybody identify or explain "F & S"? Would they still have been made by Benjamin Payne as stated? What would have been the dates for these gems?

Editor:- they were defined as bullion weights by their owner. Bullion is defined in the book *Bullion Weights* by Norman Biggs as *Bullion is almost anything made of gold or silver, provided that its commercial value depends on its metal content alone. Thus a piece of antique silver-ware, which has value because of its age and beauty, is not bullion, although it would become bullion if badly damaged. Neither is a coin which, by law or custom, can pass as money for a value different from the value of an equivalent lump of metal. Of course, gold and silver coins can be treated as bullion, and nowadays they are usually so treated, unless they have value because of their age and rarity. But,..... for many centuries there was a clear distinction between coin and bullion, and this distinction was of vital importance until recent times.*

It was stated that the weights on page 2402 are stamped "BP", and the owner equated BP with Benjamin Payne. That is not is say that they <u>were</u> made by Payne. As stated in EQM 2402, other coin weights in boxes by Payne are not marked. Because of Payne's working dates of 1829-50, and the introduction of the 1 dollar gold piece in 1849, the weights would have to have been made in 1849 or 1850, which evidence, combined with his not stamping the weights in his boxes, does make this attribution unlikely.

Knowing nothing about such matters, I refer you to P & B Withers' book *British Coin Weights*, pages 256-257, in which they state *The dollar weights have been the subject of some speculation. Although described as everything from American to Scottish in various publications, they were made in order to check either the weight of the countermarked eight reales or, more likely, the Bank of England dollar of 1804. Their period of use would have been from 1797 to around 1817 and their primary purpose was counterfeit detection.* All the weights the Withers illustrate were for the silver dollar. The Withers have not seen the set shown on EQM 2402, but point out that the weights were probably NOT made for silver dollars. If your 1 dollar weight weighs 1.672grams (25grains) then it was for weighing gold. If your 1 dollar weight weighs 26grams (414.5grains) then it was for weighing silver.

If your weights were intended to weigh gold coins, then they were bullion weights, because the United States did not mint a 2 dollar gold piece or a 4 dollar gold piece. And as 1 dollar gold pieces were only minted from 1849 onwards, that means your weights were made on or after that date. As the 3 dollar gold piece was only minted from 1854 onwards, if the weights were for individual coins, the set would have made after 1854. (But, as discussed above, the set seems not to have been made for individual coins.)

Because the weights have US stamped on them, it might be deduced that they were used in a country other than the United States, as there they had no need to put US on them. This does not preclude their being manufactured in the United States. Who was weighing several dollars at a time? British banks weighed coins in multiples, but BP and F&S are not initials familiar to the editor.

Review

Clip a Bright Guinea, by John Marsh, published by Robert Hale in 1971. New edition published in 1990 by Smith Settle Ltd, Ilkley Road, Otley, LS21 3JP, telephone 01943 467958. Paperback ISBN 1 870071 64 6, price £7.95. Cloth back ISBN 1 870071 65 4, price £11.95. Still available.

A barbarous, bloody, and inhuman murder, one of the most romantic novels in the English language, and your cherished guinea balances are all linked in this story of the Yorkshire coiners.

This account of the coiners' activities reveals why guinea balances were needed, and why there are so many of them. In the 1760s several factors combined to offer a literally golden opportunity to David Hartley, who was to be known soon as 'King' David as he ruled over his gang of coiners in Cragg Vale, Yorkshire. The coinage was in a poor state and gold coins from other countries were circulating freely. The worth of the metal in the guineas was more than the face value of the coin, so there was an obvious temptation to convert it into bullion. The Royal Mint was run in a very slapdash manner, with absentee officials paying deputies to carry out their duties. Little effort was therefore made to enforce regulations, especially in such remote parts as the villages of Heptonstall and Mytholmroyd. The charismatic David Hartley built up a gang of coin-clippers and counterfeiters who undermined confidence in the currency so deeply that honest traders often faced ruin. Some guineas (21s) were reduced by as much as 5s.4d, though the average was 3s.

Bribery, threats and informers kept the network of coiners safe until two men, alarmed by the damage they were causing the economy, decided to tackle them, William Deighton, the Supervisor of Excise whose job it was to collect taxes in the Halifax area and Robert Parker, who may have been the model for Heathcliff in *Wuthering Heights*, for many incidents in Heathcliff's life echo those of Parker's. However, unlike Heathcliff, Parker became a respected magistrate and solicitor.

Using the coiners' own tactics, Deighton and Parker bribed a member of the gang to testify against David Hartley, who was arrested while drinking in a tavern. The gang were frightened that they might all be betrayed, so persuaded the informer to say he had lied and had William Deighton killed. His death did not save David Hartley from hanging for *clipping*, but the murderers were acquitted for lack of evidence, as were some coiners. Members of the gang who had fled began to return and take up their old trade when they realised how powerless the law was to deal with them.

But Nemesis was waiting. Robert Parker was still gathering evidence, and when a coiner named Thomas Clayton was sentenced to death in 1774 he tried to buy his life with information about Deighton's murder. His killers were rearrested, this time on the capital charge of robbing the exciseman's dead body, and both were this time found guilty and hanged. Their rotting bodies, attacked by carrion crows, were hung in chains on Beacon Hill, where the citizens of Halifax could see them as an awful warning.

The operation of the Royal Mint was investigated, bad coinage was withdrawn, and as the use of bank notes and promissory notes was spreading, clipping and counterfeiting coins was no longer so lucrative that it was worth risking the heavy penalties and was never to be so widespread again. William Deighton was avenged, his murderers' bones were taken down, and Robert Parker died, full of years and honour, having earned a widespread reputation for straightforwardness and honesty. Apart from the gravestones of victim and coiners in quiet Yorkshire churchyards, the only lasting reminder of the coiners of the eighteenth century are the guinea balances which so many people felt obliged to carry in order to check whether the gold guineas they were being tendered had suffered from the attention of 'King David' Hartley and his friends. SHEILA HOLROYD

Response to Ruttees

BY L HOLLAND

I was much impressed by the beautiful diamond scale featured on the cover of EQM, 2393. In the description of the scale, on p. 2394, there is a remark on which I would like to comment, since it might be misleading:...*Ruttee was...the Hindi word for the seeds of Abrus pecatorius, called in the West, the carat.*

Abrus pecatorius is in fact (see *Encyclopaedia Britannica*) the jequirity bean (rosary pea; Indian liquorice), a leguminous tropical plant. Carat, on the other hand, is a name derived from the seeds of *Ceratonia siliqua*, the carob (locust bean, St. John's Bread). The latter tree is indigenous to the Eastern Mediterranean, and is today found growing in mild climates all over the world. Its seeds gave their name to an ancient unit of mass (1/1728 of a Roman pound - about 188mg), called in Latin *siliqua* (a name also used for a unit of silver coinage in the later Roman Empire), and in Greek *keration*. The modern carat eventually evolved from this ancient unit.

Regarding the absolute mass of these various seeds: Connor, in *The Weights and Measures of England*, p 3, describes a group of several hundred Indian rati [sic] seeds in the Avery Historical Museum, Birmingham. The average mass (of samples of about 100 seeds) is in the range 96-102.5mg. Miles, in Early Arabic Glass Weights and Stamps, *ANS-NNM* no. 111, p. 11, writing of a group of carob seeds in the possession of the American Numismatic Society (he says they are probably from Egypt), gives the average mass of 90 of these as 195mg, with the mean mass of groups of 10 ranging from 1.77g to 2.05g. It can be seen from this that the two species are very different, and also, that the mass of individual seeds may vary widely.

This does not mean that the weight-units which derive their respective names from one or other of these seeds have to be different. All kinds of units of measurement - not only of weight, but also of length, volume and area - have throughout history been given names of natural objects: body parts, seeds, eggs, ploughed fields,. perhaps in remote antiquity, measurements may have been actually carried out by means of such natural objects; however, the exigencies of commerce call for a higher degree of standardisation than Nature, in her infinite variety, provides. Such terms as grain, foot, etc., unless precisely defined, convey no more than orders of magnitude. It may be, therefore, that ruttee weights and carat weights were in certain circumstances of the same, or closely similar, mass.

Perhaps the lucky owner of the diamond scale in question could be prevailed upon to let us know the actual mass of the weights in the box? This would be very interesting, and perhaps also enlightening. And while on this point, may I be allowed to implore all members of ISASC whose possessions are displayed in the pages of EQM, to state the mass (in SI units, please!) of any weights included in the display? What is a weight with no mass good for? [Editor - any unit of weight will do, as I can convert to SI units!]

Notes & Queries

N & Q 142 — From H GREEN

In answer to Andrew Crawforth's question as to whether any more knipwaages have been found, EQM 2400, the Avery Historical Museum has a knipwaage previously unpublished. The units on the front of the blade are 6, 12, 28, 35, 56 and 70. On the rear, the units are 29 and 58. The maker's mark is the orb with a cross below, as shown in the middle of fig. 2, page 2400. This means that it is the same as no. 1 on Table 2, page 1900.

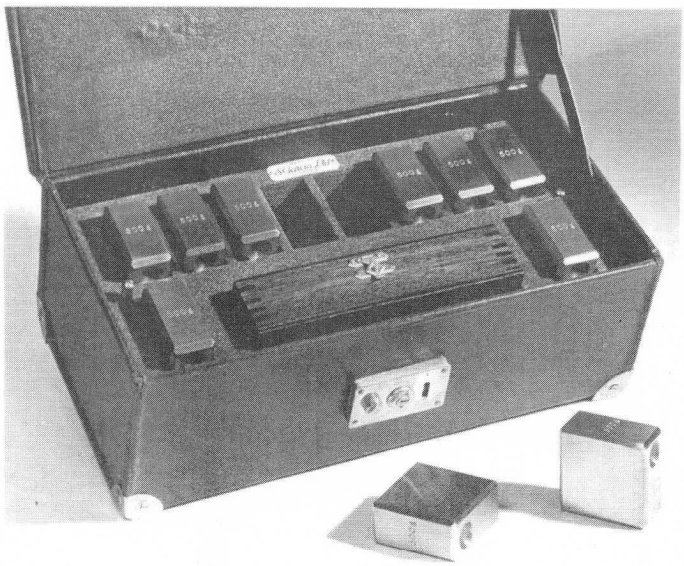
Response to Inspectors' Kit

From J GARCIA

As the last of the Garcias who knew the firm S Garcia Ltd when we made a great range of equipment for Inspectors of W & M, and having known every chief inspector from Land's End to John O'Groats, I have a few comments about page 2267. The DeGrave tripod pictured was a failure as it splayed when the beam, massive in itself, was loaded with two 56-lb weights. Many a profitable hour was spent by my firm replacing broken steel knife-edges, no easy task, re-adjusting the beam and having it verified by the B of T Standard W & M Department after such an accident. Eventually I designed and we manufactured and sold a large number of our Non-Splay tripod.

Fig. 1. ^^ Set by S Garcia Ltd, spherical avoirpudois weights each engraved London County Council, No. 2617, 7-lb to 1-lb, and 10 rectangular brass weights, 8oz to ½dram contained in a velvet-lined mahogany box, the whole contained in a baize-lined mahogany box with carrying handle.
Courtesy J H Palmer & Son, auctioneers Burnham on Sea

The reason why the Inspectors of W & M used spherical weights was that they could not get mixed up with traders' weights, as would be the case with flat circular and bell weights. Spherical weights were very difficult to make, although I imagine nowadays with NC lathes the task would be much easier. The very smallest were made with a shaped turning tool, the middle-sized ones were a job for a skilled turner and the largest ones, 10-lb to 56-lb, were cast and you can imagine the difficulty in mounting these on the lathe and dressing them, especially if they had loop handles. Some of the other weight manufacturers cast all sizes and, in consequence, the 'spheres' were most peculiar, ranging from Buddha-like shapes to squashed tomatoes. Generally speaking, and without being immodest, ours were of much better form.



The other form of weights much beloved by the inspectorate was the brick form, because they stacked and were different from all commercial weights (and thus not left behind after a visit, or used for trade if they *were* left behind). The doubling of weights was used for testing length of arm. The 500g or 1-lb weights, (fig. 2) were added one at a time for testing the charts on fan scales.

Fig. 2. << S Garcia Ltd 500g test weights.
Courtesy J Garcia

ISASC

EQUILIBRIUM®

QUARTERLY MAGAZINE OF THE INTERNATIONAL SOCIETY OF ANTIQUE SCALE COLLECTORS

2000—ISSUE NO. 2 PAGES 2449-2476

ERRATA IN THE 2000 No.2 ISSUE OF EQUILIBRIUM
PAGE 2450 READ 3fl AS $3^1/_2$. ON PAGE 2455 Fig.13 fi APPEARS TWICE INSTEAD OF $^1/_2$ AND AGAIN ON PAGE 2468.

Cover Picture-Modern Postal Scales

It is well worth keeping an eye on shops and catalogues that sell useful little gadgets. A postal scale might be made for a brief period then disappear, leaving a whiff of our culture for future generations. None of these is bigger than 3fl inches (100mm) long.

Top left – Black plastic case/poise, with a red swivelling button, and white plastic chart, c.1980. Anonymous. Bought in UK. Very attractive movement.

Top middle – White stove-enamelled poise and white plastic suspension shears. Made by Maul of Germany. Sold in red plastic wallet with a transparent front. Although the case is flimsy, the scale is robust, c.1986. Note how rapidly the graduations get closer together with this leverage.

Top right – Val-U-Scale made by 4 R's Mfg. Co, E. Providence, RI, USA in 1981. Sold as a Troy and Gram scale, with a paper folder explaining the units, the composition of gold and silver, values, and how to sell valuables. Supplied by Redco Supply Co, PO Box 192, Wywantskill, NY, 12198, USA. They added a paperclip, a chart of postal rates in USA and a diagram showing how to use the scale for weighing letters. Very attractive, being made of satin-finished brass, and supplied in a brown mock-suede leather wallet.

Bottom left – Anonymous grey scale bought in UK. Missing its letter clip. Aluminium quadrant with pressed numbers blacked in. Pressed tin poise held together with tabs.

Bottom middle – Vivid green stove-enamelled steel, possibly made by Maul in Germany. Anonymous. Sold in black plastic wallet with transparent front. Chromed clip and hanger.

Bottom right – The lightest scale, made of aluminium with steel poise. Anonymous. Goes up to 3.5 ounces! Bought in London in 1974. D F C-H

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European Coin-ops

BY D F CRAWFORTH-HITCHINS

Part 1. 1884-1902

How was it that viable coin-operated person scales appeared suddenly in 1884 and 1885 in Britain, Germany, France and United States, in spite of their complex mechanisms? Reading patents and records prior to 1884, it seems that all the necessary elements were already in use, and had the teething troubles already ironed out of them.

Taking the elements individually, the most basic were

1..To have a platform scale for persons, to be read by the user.

John Joseph Merlin of London made a superbly elegant one in 1786, with a platform and steelyard, as did Thomas Weeks, EQM 694. Augustus Siebe based one on his elliptical spring scale, with a height measure, for the 1851 Great Exhibition in London. See fig. 1.

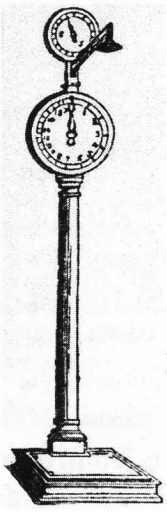


Fig. 1. ➢➢ Siebe's entry for the Great Exhibition of 1851. This stand-on scale would not have seemed strange fifty years later. Note the rigid mechanism for the disc lowered onto the head, not unlike the mechanism in Colby's patent, page 2458.

2..To have a dial face on a platform scale.

Hanin fils of St. Romaine and Paris invented a C-spring with dial, in around 1792 (EQM, 1867), with, admittedly, an inadequate platform. Alexander Alliott patented a combined platform scale with a spring balance on 14 March 1848. Elisa Catenot (of Catenot, Béranger & Cie) in France put a dial read-out on a steelyard platform scale on 20 July 1864. See fig. 2.

3..To record automatically the load on a platform.

Robert Goddard took out a patent on 27th Feb 1834, and P B G Debac took one out on 26th July 1834, neither of which is known to have been made. David Napier and James Murdoch patented a dial-face platform scale with a recording device on 20 July 1848, and Joseph Béranger of Lyons, France, patented one on 19 March 1849. William Tatters, engineer of Patmore St, New Road, Battersea, patented a simple counting device specifically for weighing-chairs on 17 Feb 1871. See fig. 3. W & T Avery's 1885 catalogue called attention to their Patent Self-Registering Steelyards (Chameroy's Patent, of Paris). See fig. 4.

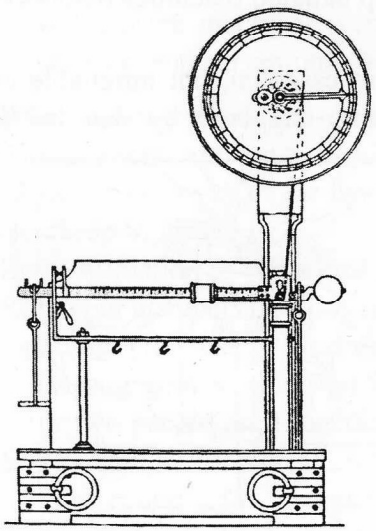


Fig. 2. ⮝⮝ Elisa Catenot got provisional protection for an '*improved reading-device for a steelyard weighing machine*' on 20 July 1864. The poise is attached to a cord which goes under the steelyard, round a wheel and up into the head, where it pulls the pointer round.

4..To have a pendulum resistant on a platform scale.

A C Herrmann patented a single-pendulum platform scale on 21 April 1865. A Lafargue, engineer, of 10, Park Road, Newcastle-on-Tyne, patented a double-pendulum platform scale on 12 June 1869. See fig. 5.

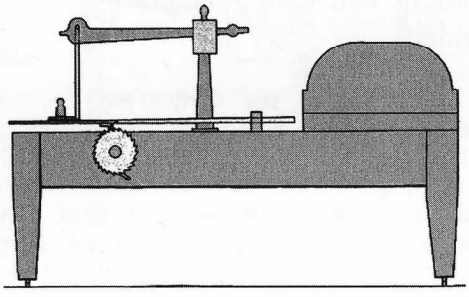


Fig. 3. ⮟⮟ W Tatters' 1871 illustration is, perhaps, the first evidence for the standard weighing chair with a steelyard beside it. *'When a person sits on the [weighing] chair, before he can be weighed, the attendant first slides the rod (on which the scale rests) before him, which sliding action strikes the toothed wheel releasing the weighing scale and moving the toothed wheel round the space of one tooth, thus indicating one use or one penny. Before the person can get out of the chair the bar must be again brought back to its original position thus making ready the apparatus for further use '*

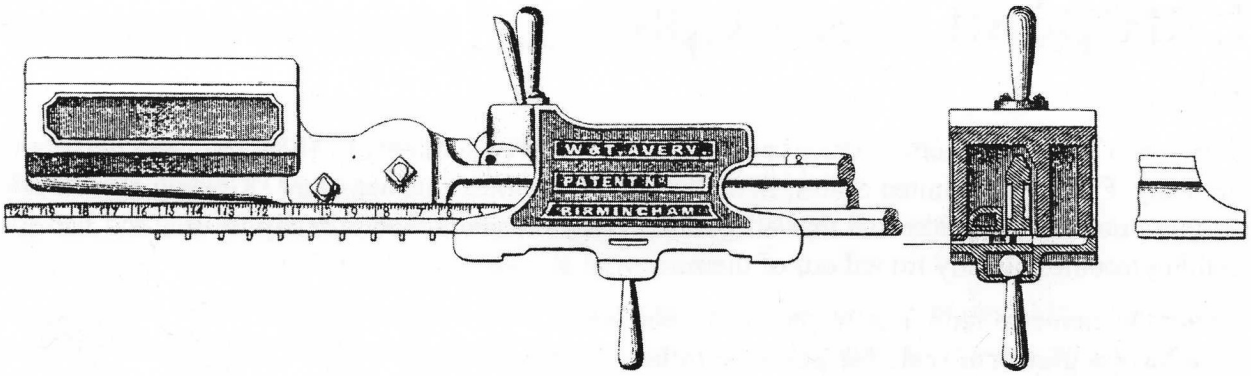


Fig. 4. ⮜⮜ W & T Avery catalogue of 1885 *'Sole Manufacturers of Self-registering Weighing Machines (Chameroy's Patent, Paris). The only machines which print the weight. Patented in Great Britain and all the English possessions'.* For steelyard platform machines from 3 cwt to 30 ton capacity. *'By means of this apparatus an indelibly stamped single, duplicate or triplicate record can be kept of the weight of the goods weighed, taken at the time of weighing by the machine itself.'* Avery would replace the beam on their own or other manufacturers' platform scales, to update them. Courtesy N Biggs

5..To reposition the mechanism ready for the next weighing.

J M Napier patented his automatic feed weigher (for sorting coin) with a trip mechanism on 30 June 1871. This may seem a nebulous problem, but no coin-op could work (without a human attendant) until this problem was solved.

6..To prevent too much vibration.

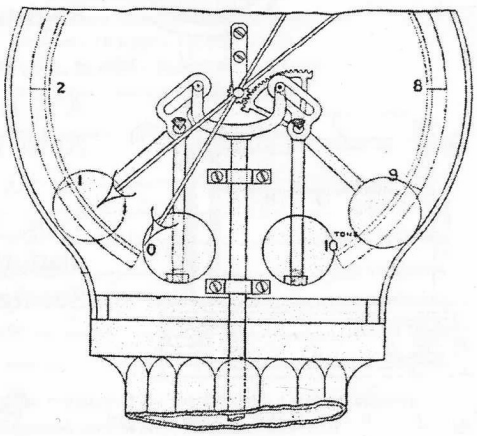
R Lamont patented a glycerine-filled damper on 16 Dec 1882. M Martini calmed the movement of the pointer by putting a slot in the pointer and having a pin coming through the slot, the pin constrained by rollers, in his patent of 22 June 1887!

7..To record weight with electricity.

T Williams patented a die which left impressions on paper on 17 Nov 1882. The use of electricity came late to coin-ops, presumably because it was difficult to wire up isolated machines outdoors.

8..To combine multiple functions to operate automatically.

Grain-feeders were patented so frequently that they obviously were essential, but unreliable or unsatisfactory. The need for complicated consecutive movements triggered by one initial movement was undeniable, and many companies patented amazing, elaborate constructions, after which a coin-op must have seemed a very simple object.



9..To show weight after a coin is inserted.

Percival Everitt combined the coin-operation that had been prevalent in the amusement arcade with a weighing machine on 13 Dec 1884 (EQM 2433-2435). There was still room for improvement, but he had started the craze for casual weighing.

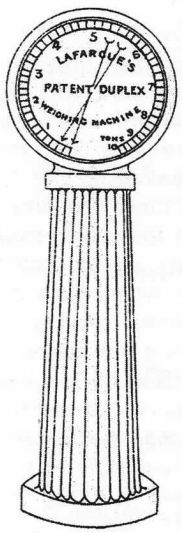


Fig. 5a. ⮜⮜ The more we see early developments, the less one can assert that "This is the first". Lafargue's design of 1869 is very close to a 'big-head lollipop', but the American ones were lauded and copied after 1900, whereas Lafargue's was almost ignored except in railway circles.

Fig. 5b. ⮜⮜ Alphonse Lafargue's double pendulum scale, designed for railway use. Capacity 10 tons. It was more than 30 years before this principle was used in the domestic market. The system seems practical, easy to adjust, and not liable to damage, so it seems bad luck that it was not adopted for other uses.

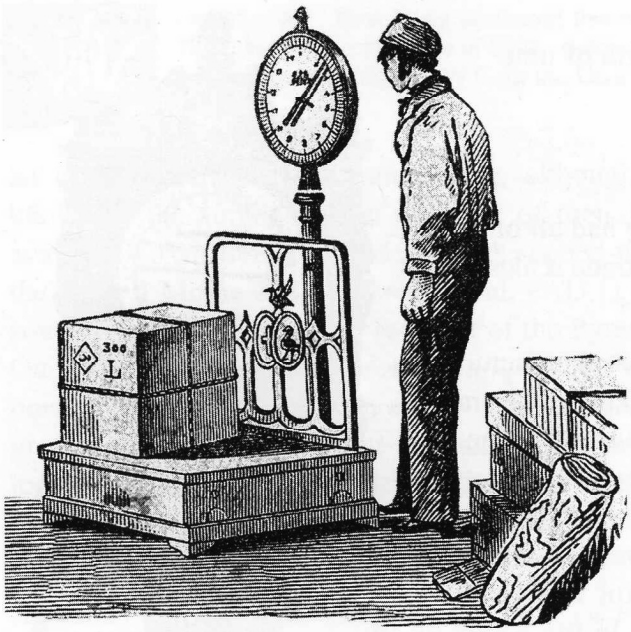


Fig. 6. ⮜⮜ H Pooley dial and platform machine, c.1872. The name is not as catchy as 'lollipop'! Note the decorative rest. This design could easily have been utilised as a person scale. Taken from a scrap-book

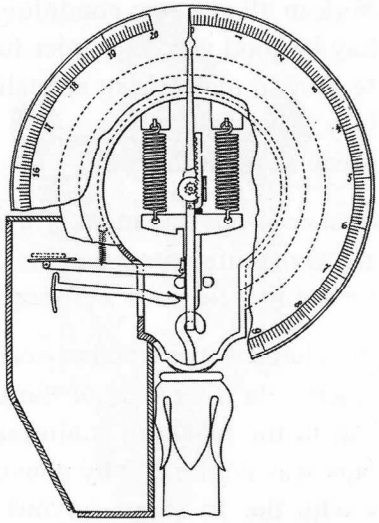


Fig. 7. ⮜⮜ Geo. Salter & Co, German patent of 22 Aug 1886. The coin was inserted to release the pawl, then the person mounted the platform.

Courtesy J Schlender

As problems were sorted out, patents were applied for; dampers to prevent damage when a load was removed (Hodgson & Stead, 13.Sept.1886), inking the printer (United States Machine & Inventions Co, 12 July 1887), combining more than one function (United States Machine & Inventions Co, 12 July 1887), electric switch (E C Marc, 30 Nov 1887, see fig. 8) etc, until the patenting of coin-op scales petered out around 1900 in Britain and 1902 in Germany. The use of the coin-ops did not lessen so perhaps the conclusion should be that by then the problems had been solved and the machines were relatively reliable. [Editor - This scan through the patents is not exhaustive, and serves only to give some idea of the accumulation of ideas needed for a coin-op.]

What makes a good coin-op scale? It has to fulfil these criteria:

Attract attention from a distance

Pique the curiosity of the bystander and have an element of originality or excitement

Be cheap to use

Be an attraction to bring customers to the site

Robust in unsupervised positions

Difficult to use fraudulently (wrong coin, counterfeit coin, or two people on it together)

Store enough money to be left unattended for weeks or months

Provide a profit for both the site-owner and the franchisee

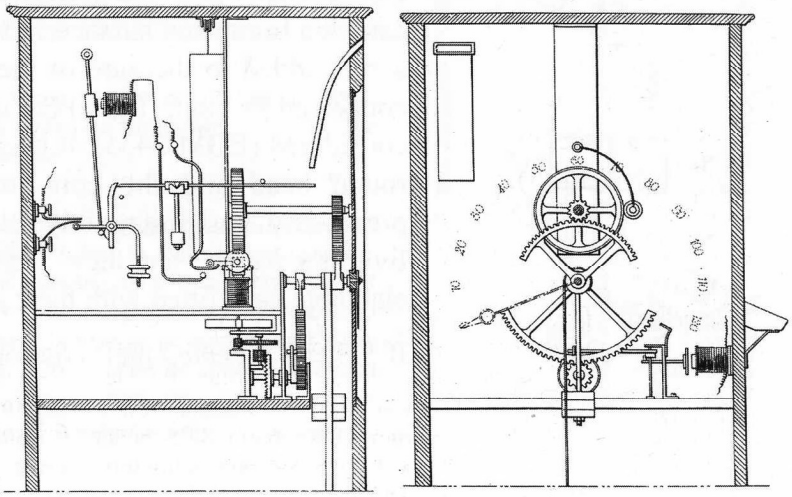


Fig. 8. ➤➤ E C Marc patent of 30 Nov 1887 for an electrically operated coin-op. Because this is so innovative, two views of the interior are shown.

Work in all climatic conditions expected on site
Stay in good working order for a reasonable length of time
Be easy to maintain in appealing condition
Easy to repair
Cheap to manufacture

Most coin-ops had most of these features but few had all of them, and so manufacturers were in competition. With trade scales, only the last five features were important.

The element of attraction seems to have kept the manufacture in America in the hands of the arcade-machine makers rather more than in the hands of traditional scale-makers, but in Europe the trade was dominated by conventional scale-makers. Perhaps that is why the frivolous, joyous confections were most frequently invented in America, while British coin-ops remained relatively dignified and conservative. Perhaps that playful element also explains why so many examples have survived in the hands of collectors in America and so few have survived in Europe.

G Salter & Co made scales to Everitt's patent (EQM 2435), no catalogue evidence being available, but a surviving example showing a clear glass dial with the graduations painted round the circumference, so that the user could watch the upper machinery operating. The user could see the distinctive shapes designed by Everitt rocking and turning, so it seems surprising that Salter got a patent in 1886 for a boring double-spring balance with the mechanism concealed behind a white dial. They had removed a definitely attractive feature leaving the user with only a pointer to watch going round.

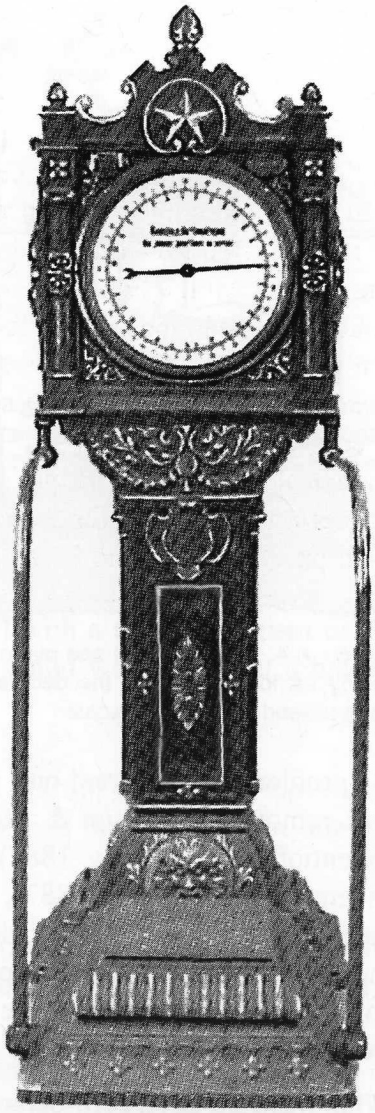
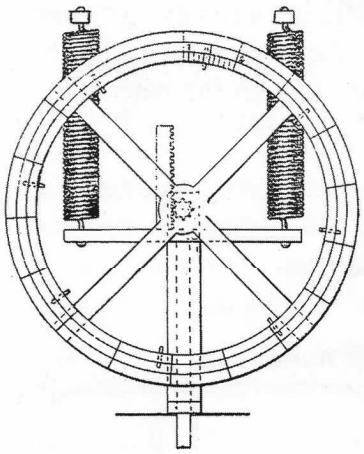
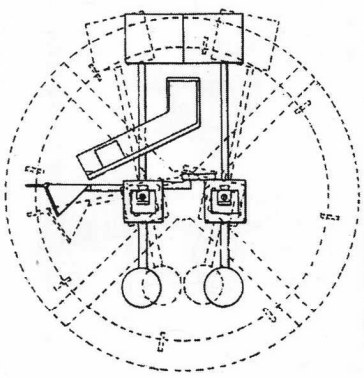


Fig. 9. ⮜⮜ J Mothe & Cie imported into France a Geo. Salter & Co. coin-op some time after 1886.
Red Meade collection





George Salter patented in Germany on 22 Aug 1886, a coin-operated catch on his spring balance. The lever that receives the coin sits in a box added to the side of the lollipop, apparently in a most ill-conceived fashion, (fig. 7) but if the shape of Salter's ornate case is considered (EQM 2435), it becomes obvious that the case covers a round head and the coin-box most decoratively. They had previously cast incredibly elaborate cast-iron cases for their Everitt's patent, but they changed the case for another, equally elaborate case fitted with their patent "Lock Money Bags".

If Salter's *patented* their coin-op scale in Germany, they must have

Fig. 10. ⮜⮜ Patented on 13 Aug 1886 by George Reimann, trading under the name L Reimann, 32 Schmidt Str, Berlin. Because the unit of weight has to show in the little window at the top, the dial rotated as the customer stood on the scale. The shutters opened when the coin was inserted.

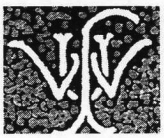
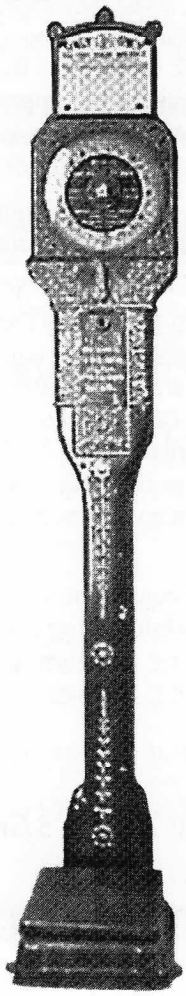


Fig. 11. ➢➢ Emil Ubrig illustrated this scale in his advert of 1889, and in his catalogue of 1892. Below the dial, between the scrolls, was their logo, U W F, for the Ubrig Waagenfabrik.

anticipated *selling* their scales there, although no example is known to the author, but an example of their sale in France is available. Red Meade owned a superb second-design Salter with the name J Mothe & Cie, Place Royal, PAU [a town in the very south-west of France, in the foothills of the Pyrenees]. See fig. 9. On the glass dial is *Bascule Automatique. Se Peser pour bien se porter* [Automatic Platform scale. Weigh for well-being]. The great weight of this huge cast-iron scale must have caused serious logistical problems in shipping it down to Pau, and cause us to reflect on the reason for a French operator's buying an English coin-op. Were there no French equivalents at that time?

A French engineer, Edmond Casimir Marc of Paris, did patent a ticket-printing machine for coin-ops in 1887. See Fig. 8. He wrote of a weighing platform of the ordinary kind, and then concentrated on explaining his ticket machine which was operated by an electrical current, this being the first application of electricity to coin-ops that has been identified. Not only was the printer worked by electricity, but the brake that prevented the weighing mechanism from working was also released by an electric current switched on by the coin's depressing a switch! As with other British patents, he wrote *I am aware of Everitt's Specification No. 16433 of 1884 and I do not claim anything therein described and* ***claimed***. This repeated assertion makes it sound as if Everitt was very protective of his rights.



The German company of L Reimann in 32 Schmidt Strasse, Berlin, was another manufacturer who concealed the whole mechanism,

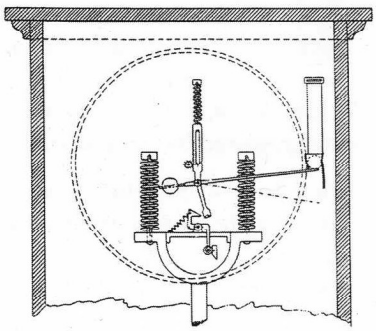


Fig. 12. ➢➢ Emil Ubrig patent of 17 March 1887. Although the case was elaborate as shown in fig. 11, the mechanism was very simple.

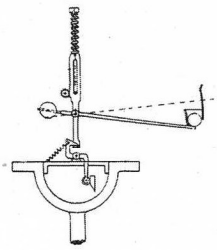


Fig. 13. ➢➢ This unidentified English scale was imported into the USA. The maker failed to realise that 'Stones' would puzzle Americans, but the cost to use it was only half the normal amount, so maybe people were prepared to do their own sums, reckoning 14 pounds to each stone! *Only fi cent to try your weight. Do so often as change indicates change in health. Drop fi cent in front drop slot, move lever to right and release for your stone age weight.* The design was patented in 1900.

Red Meade collection

leaving the user with only the separation of the little shutters to watch for. In America, manufacturers had understood clearly that, to entice the user, added attractions were needed, such as the attempt to alter one's weight to match the chart, a mechanism to watch or music to hear. Reimann's machine was very basic, as shown in his patent of 1886, (fig. 10) and seems, with hindsight, to be in dire need of some stimulating additions.

Emil Ubrig of Westend, Berlin, also made a separation of the operation of the scale from the operation of the indicator, in this case the pointer. On 17 March 1887, he patented in Germany an elegant solution. Fig. 12. When the coin tipped a lever, it attached the pointer ratchet to the main yoke that descended when loaded. The scale would not operate if the person stood on the platform *before* inserting the coin so the coin was placed in the scale and then the person stood on it. Ubrig, like other German makers, designed superb cases for their scales, (fig. 11) covered in lively foliage, scrolls, mythical allusions, masks, and sea-creatures. The Columbus, shown on page 2425, is another example of German artistic sensibilities.

Part 2 in the next issue

Obituary, A George Mallis (1915-1999)

A George Mallis, a founding member of ISASC, derived great satisfaction from his enthusiastic devotion to the disciplines of both metrology and numismatics. He died of heart-failure, aged 84, in Springfield, MA, on Dec. 30, 1999, surviving by five days Dorothy (Wruck) his wife of 59 years.

Mallis was an enthusiastic numismatist as a child and became intrigued with U.S. silver dollars coined in 1878 and thereafter. His first publication in that field was in 1964. He was joined by Larry Van Allen in 1971, when they wrote *Guide to Morgan and Peace Dollars*, which has been revised and republished extensively. The popularity of this book caused the technical varieties to be referred to as VAM varieties from the initials of the authors. He belonged to the American Numismatic Society, American Numismatic Association, Numismatic Literary Guild, British Numismatic Society and many other organisations. He was appointed by the President of the United States to the Assay Commission in 1962.

He worked as a Civil Engineer on many New England buildings, then joined the U.S. Army Corps of Engineers and served as an officer in the Asia-Pacific and Europe-Middle East-Africa theatres, retiring in 1971 as a Lieutenant Colonel.

Mallis wrote an article on American counterfeit coin detectors [CCDs] for the first issue of EQM (12-15) in 1978 and steadily continued to write articles for ISASC for many years. He broadened out to include coin scales and coin weights. He was fascinated to locate and study patents for American CCDs because so many were adapted from British and other foreign instruments. In 1990 he published *Proposed Standard Designations for Coin Weights* for European gold coins to which was added in 1991 a volume on weights for silver coinage of Great Britain and in 1992 a volume on German gold coin weights. He and Eric P Newman jointly wrote a 400 page book entitled *U.S. Coin Scales and Mechanical Counterfeit Coin Detectors* which was published in 1999. This included many engineering drawings prepared by George Mallis.

He lectured and wrote articles for public benefit. His emphasis was on education and enrichment of enjoyment in the areas in which he was an expert. He collected a host of friends whose lives he enlightened by his helpfulness and by his desire to represent accuracy and co-operation.

Eric P Newman

PO Wt Testing, 1856

Report by Professor A D Bache to the US Treasury Department dated 1st January 1848 to 31st December 1856.

Three sets of ounce and half-ounce weights were delivered to the General Post Office Department, for the purpose of testing the accuracy of balances for ascertaining the weights of letters.

Pennywise, Not Pound Foolish

Part 2, 1887-1920

Text by R HENDRICKS WILLARD
Captions by D F CRAWFORTH-HITCHINS

Part 1 described the arrival in the United States of two European coin-operated scales, the simple Everitt patent from England and the massive Columbus scale from Germany, and reveals how, in just sixteen years, the idea evolved into a wide variety of playful weighing machines that people from all walks of life wanted to try frequently. Production was initially centered in New York, New England, and the Eastern Seaboard, but by the turn of the century, the major companies were located in the Midwest, and inventors from as far away as San Francisco were patenting their ideas for ever more appealing versions of what might be termed recreational scales.

There appear to be hundreds of US patents, judging by the list of 22 issued between 1888 and 1900 and relating to one single machine. See Fig. 1. By contrast, all the UK coin-op patents issued during that same period add up to 22 and all the German ones to a mere 21.

Coin-operated person scales occupy a special niche in American scale making. Nearly all of them were produced almost as an after-thought by firms already engaged in producing vending machines of all kinds. Chicago was to become the center of the industry in the early 1900s, and early evidence of that development comes from US Patent 391,513 issued on October 23, 1888 to Edward J. Colby, engineer, of 1007 Opera House Block, Chicago. This was a complex machine for measuring weight/strength /height/lung strength and *designed to be stood in places of public resort, railway stations, and the like*. One coin released the locks on all the parts, and the four

US Pat No	Date	Patentee/s	Address	Assigned to	Address	Invented
361,246	4.12.1887					
365,353	6.21.1887	W R Smith A L Washburn	Bandera, TX New York, NY	W R Smith	New York, NY	Coin-op elec. wg/mc
369,234	7.30.1887					
374,362	12.6.1887					
375,102	12.20.1887					
380,837	4.10.1888	T A Weber	New York, NY	Nat Wg/mc Co	New York, NY	Coin-op Wg/mc
?	7.7.1888					
392,698	11.13.1888	W R Smith A L Washburn	Bandera, TX New York, NY	W R Smith	Bandera, TX	Coin-op elec. wg/mc
393,325	11.20.1888	J C J C Faure	Montreal, Can.			Coin-op Wg/mc
DE 18,818	12.18.1888	H A Schneekloth	New York, NY	Nat Wg/mc Co	New York, NY	Case for Wg/mc
395,926	1.8.1889					
402,748	5.7.1889	F J Lancaster	New York, NY	Nat Wg/mc Co	New York, NY	Coin-op Wg/mc
406,132	7.2.1889	J C J C Faure	Montreal, Canada	American Automation Wg/mc Co	New York, NY	Coin-op Wg/mc
418,822	1.7.1890	W R Smith A L Washburn	New York, NY Niantic, CT	Standard Automatic Sc Co	New York, NY	Coin-op Wg/mc
422,230	2.25.1890	F J Lancaster J H Lancaster	New York, NY Arlington, NJ	Nat Wg/mc Co	New York, NY	Coin-op Wg/mc
437,166	9.23.1890	W R Smith	New York, NY	Standard Automatic Sc Co	New York, NY	Coin-op Wg/mc
440,728	11.18.1890	W R Smith	New York, NY	Standard Automatic Sc Co	New York, NY	Coin-op indicating mec.

Fig. 1. ⩓⩓ The 22 patent numbers that appear on the face-panel of one cast-iron National Automatic Weighing Machine Co, 60-62 Murray Street, New York, NY. [DE is protection for an artistic design, not protection for a mechanism.] This table gives an amazing insight into the vigorous collecting of patents by L W Baldwin showing his acute business sense in running his National Automatic Weighing Machine Company. Courtesy D Bueschel

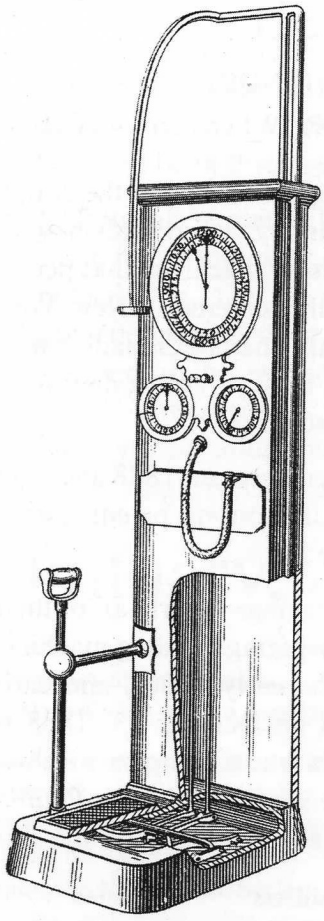
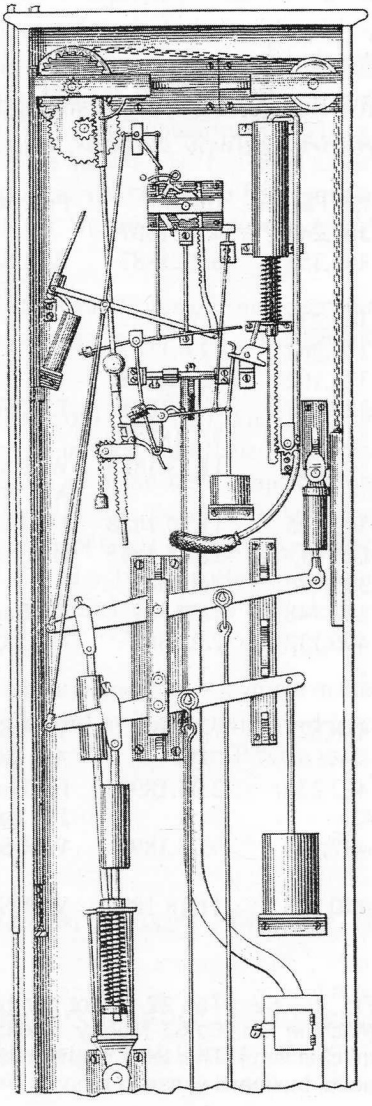


Fig. 2. ≺≺ Colby's British patent no. 15,233 of 23.10.1888. The pendulous tube curving down from the very top, with a disc at its bottom-end, was the height-measuring device. The outer graduations round the large dial concerned lifting power. The inner graduations indicated weight. The small left-hand dial indicated lung-power. The right-hand dial indicated height. The tube at hip-level was the lung-testing tube. The handle on a stalk to the left of the platform was to ascertain [left-handed] lifting power.

pointers went round to register the various answers. No examples of this complex mechanism are known to exist, but it seems likely that Colby produced it, or at least intended to, as he took out a British patent on the same date. See figs. 2 & 3.

Rosenfield Manufacturing Company

Beginning his career as a coin machine designer and a co-founder of the Amusement Machine Company of New York in 1890, William W Rosenfield created a series of highly successful coin-op card machines. In 1896 he bought out the stock-holders of that firm and reopened as the Rosenfield Mfg Co. They expanded their line to include automatic payout slot machines, arcade and peep show machines, and coin-op photographs. In 1905, they entered the coin-op scale market with a beam [steelyard] scale of their own design.



Their second scale, the Rosenfield Reliance, is widely regarded as one of the most beautiful coin-op scales ever made. It has a highly decorated column similar to the one produced by National's designers but modified by putting a large cash box directly below the face for easy access and infrequent collections. There is an enormous dial casing with distinctive graphics atop the slender decorated column. Although it was yet to be so named, this was the first viable Big Head scale. See figs. 6 & 7.

Watling Manufacturing Company

The Watling Manufacturing Company enjoyed the distinction of leading the industry in every phase of coin-op scale development, from the early twentieth century wooden cabinet guessing scales through the Lollipop era from 1914 through 1931, and then into the smaller waist-high scales of the 1930s through the 1970s. The firm was formed by two brothers, John and Tom, who came from Cincinnati to work with the Daniel N Schall Company, a Chicago slot machine producer. By the beginning of 1902 they had bought the owner out and become established coin machine makers with a full line — except for scales. Among their best sellers were the automatic payout colour wheel slot machines invented by a San

Fig. 3. ≻≻ Colby's 1888 patent. The specification that went with this drawing is so complex that the editor has been unable to comprehend how this machine worked. [Any members wanting to pit their wits against E J Colby should write to the editor, and will receive the full patent.]

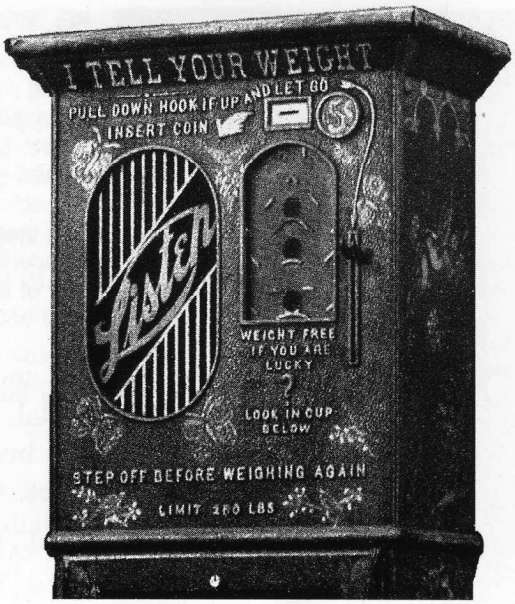


Fig. 4. ➢➢ After the complexity of the Colby, and the weight, fortune and music scales shown on page 2431 (made/retailed by the Chicago Recording Scale Co. in Waukegan, IL) the development of phonographs to speak the weight seems inevitable! Moore Talking Scale Co. of Boston made speaking scales in 1902, with a mechanism that broke easily and a boxy cabinet that depended for attraction on the novelty of the machine speaking intimately to the user. "Listen", the one here, is anonymous, but somewhat more exciting, in that, if the user put the coin in the right slot, the coin was returned to the lucky user. The green cabinet was plain in profile, but was originally covered with gold floral flourishes and decorative arches.

Franciscan, Gustav F W Schultze. In 1901 Schultze created a tall, floor-standing, scale that resembled the Everitt's Patent machine of the mid-1880s. But Schultze had incorporated an intriguing feature. If you could guess your weight and set a pointer at it on the dial when you stepped on the scale but before you deposited your coin, you got your penny back. See Fig. 8.

Recognizing a good thing when they saw it, the brothers took an early lead in the coin-op scale industry by signing an exclusive marketing agreement with Schultze. They added his innovation to their introductory 1902 line.

While Watling continued to lead the field, they soon had lots of competition. In 1912 and 1913, several coin-operated beam [steelyard] scales appeared in the market.

Mills made a beam scale, *Mills Accurate Balance Scale* emphasising its precision, although an inspector might have said that there was little difference, in practice, between steelyards, spring or pendulum scales! The narrow column made these scales easy to vandalise by snapping off their heads.

By comparison with the beam scales, Watling's Guessing Scale looked clumsy and old fashioned. Searching for a product advantage, Tom Watling found one in the well-designed line of counterbalanced scales being produced by the Toledo Scale Company. These scales employed the pendulum principle. Since the mechanism didn't use springs, which lost their tension and accuracy as they wore out, it could be promoted as *springless,* a subtle way of implying superiority. He began experimenting with idea of Big Head scales similar to the Rosenfield. The main problem was that such a mechanism required a much larger case.

In May 1914 the Watling Manufacturing Company built their first coin-operated Counter Balance Scale and filed the mechanical and design patents. Its huge size, plus the penny-back feature attracted attention. The large 24 inch

Fig. 5. ➢➢ Caille Brothers of Detroit developed The Washington to compete with the Watling Mfg. Co. guessing scale. The Washington and its variations were immensely popular from their inception in 1903 until at least 1913. The variations included plain boxy cabinets; with ornate nickel-plated trim asking Are You Gaining or Losing Weight?; with a domed marquee of filigree stating "Correct Weight One Cent"; with guessing slots so that the users might get their money back; or with music playing. Note the two circular verification labels stuck on by the inspector next to the tip of the pointer.

Courtesy P Wehman

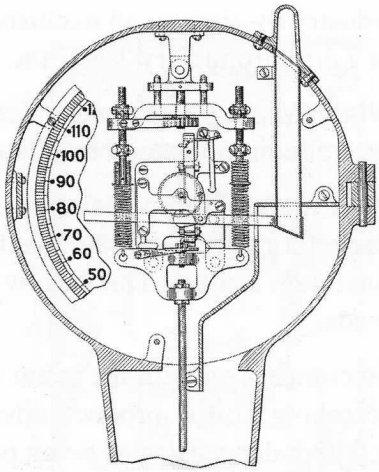
Fig. 6. ≺≺ Rosenfield Mfg. Co. Reliance, patent applied for in January 1907, but not granted until Nov 9th 1909. The original marquee with filigree round "Your Correct Weight One Cent" has not survived. It has been replaced by a chart headed "Are you in health? Consult this table furnished by the Metropolitan Life Insurance Company". The dial has in the middle "Stand in center of platform. Then drop one cent. This scale is regularly inspected and tested and is correct. Rosenfield Mfg. Co." Capacity 300lb. The platform has in the center "Rosenfield Mfg. Co. New York". Note the wonderful lion's mask in front of the cash-box. Red Meade reported that only four of these beautiful scales survived their tough outdoor life.

Red Meade collection

dial, mounted on a slender fluted column with a Greek Ionic capital, looked like a giant lollipop. The nickname stuck, and in time became the generic title of a whole succession of coin-op scales.

Toledo Scale Company

Toledo's engineers not only pioneered the technology embraced in Watling's Lollipop but also supplied the sobriquet *Big Head.* The company's origins date back to 1899, when Allen De Vilbiss of Toledo, Ohio, patented a pendulum computing scale and established the De Vilbiss Scale Company to produce it. In 1901 Henry Theobold bought the company and the patent rights, reorganizing the firm as the Toledo Scale Company.



Like Fairbanks, but unlike every other producer of coin-op scales, Toledo was first, last, and always a scale maker. The new firm pioneered a full line of pendulum computing and non-

Fig. 7. ➢➢ Rosenfield Mfg. Co. patent no. 939,747 of Nov. 9 1909. This is the original patent, to which the large cash-box was later fitted. The weighing mechanism operated as soon as a person stood on the machine, but the pointer only went round when a coin was inserted. Great care was taken to prevent fraud, presumably because the company had learned the hard way!

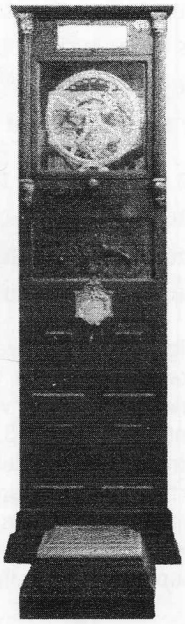


Fig. 8. ➢➢ Watling Mfg. Co.'s Style 1 Guessing Scale, designed by Schultze, resembled the boxy wooden scales of the late nineteenth century, but had an added enticement. By guessing one's weight to within a pound, one got the penny back. That did the trick; the customers flocked to try it. By the end of the year, Watling had already turned out six different models of this landmark machine.

D Bueschel

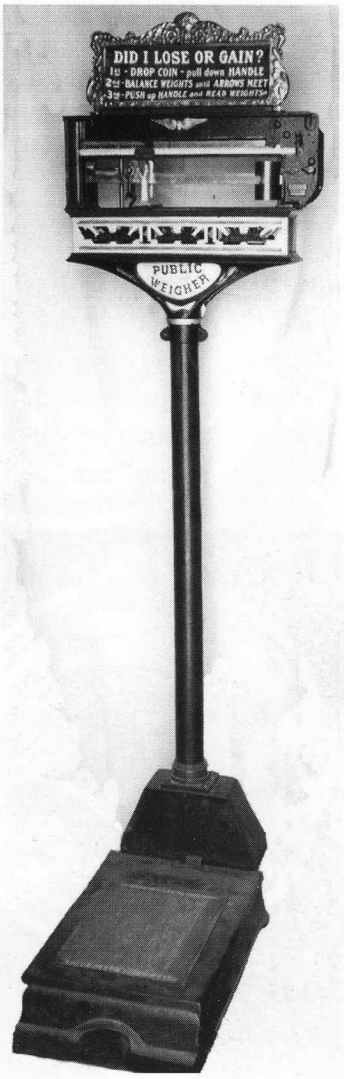


Fig 9. ➢➢ Fey's Public Weigher scale. The marquee reads "DID I LOSE OR GAIN? 1st DROP COIN – pull down HANDLE 2nd BALANCE WEIGHTS until ARROWS MEET 3rd PUSH up HANDLE and READ WEIGHTS" On the casing it states "Public Weigher." It must have been fun to move the poises along the steelyard and read the weight carefully, rather than standing passively on the platform. The designer and maker was Charles Fey, a San Franciscan who was working in the Mills Novelty Co. plant at the time.

Courtesy W & J Berning

computing scales for retail use, along with a wide variety of automatic scales for industrial uses and having capacities from ounces to tons. To increase their market share, after 1910 they added person scales for use in men's clubs, hospitals, banks, and other institutions that gave a free weighing service.

Their first significant person scale, Model 8300, was a tall white porcelainized cast-iron column scale with a large round dial at the top enclosing the counterbalanced mechanism typical of the firm's industrial scales. Affectionately referred to as the *Big Head,* Model 8300 became the style leader for a long line of Toledo scales and also the most copied format in the field of coin-op scales. The dial carries the legend "Your Weight Free' and "Toledo - No Springs" on its face. A follow-up design called the Model 8300-T Official Athletic, initially produced for schools and universities to use in their athletic programs, became the recognized scale for sporting events such as boxing, baseball, the weighing-in of jockeys before a horse race, and other activities where weight was a factor. While many race-tracks now have digital scales, these Toledo Model 8300 T scales are still in use at Saratoga Springs, New York, Race Course.

The firm's first coin-controlled scale, introduced in late 1919, was the work of Toledo scale engineer Hubert A Myers. To this Model 8300, he added a detachable coin-accepting and ticket-issuing device. Another version of the Big Head, the Advertising Scale, the design of

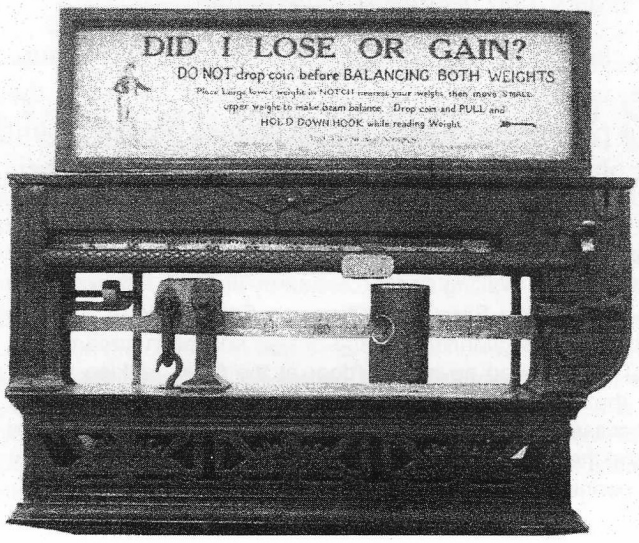


Fig. 10. ➢➢ Another version of Fey's Public Weigher, this one called the Pacific. Fey was in Fond du Lac, Wisconsin, in 1912, and had his machine made by Pacific Scale Works there. The rare instruction label states "DID I LOSE OR GAIN? DO NOT drop coin before BALANCING BOTH WEIGHTS. Place large lower weight in NOTCH nearest your weight, then move SMALL upper weight to make beam balance. Drop coin and PULL and HOLD DOWN HOOK while reading weight." The large poise is quite obvious, but the small one is the rectangle with rounded corners almost directly above the large poise, that is read off on the bar that is above, and almost obscured behind, the roughened beam along which the small poise moves.

Courtesy D Bueschel

Public Scale Co. of Chicago also made a Triple Pillar beam scale that was used throughout the transportation system in Chicago because they had a monopoly from 1914 until 1950. Caille Brothers' beam scale was over six feet tall!

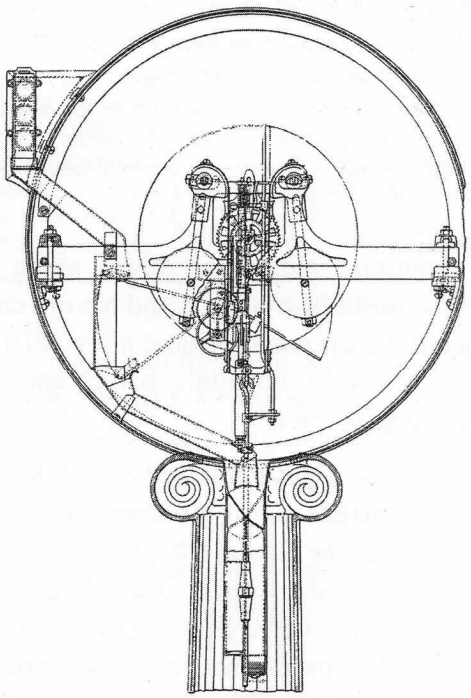
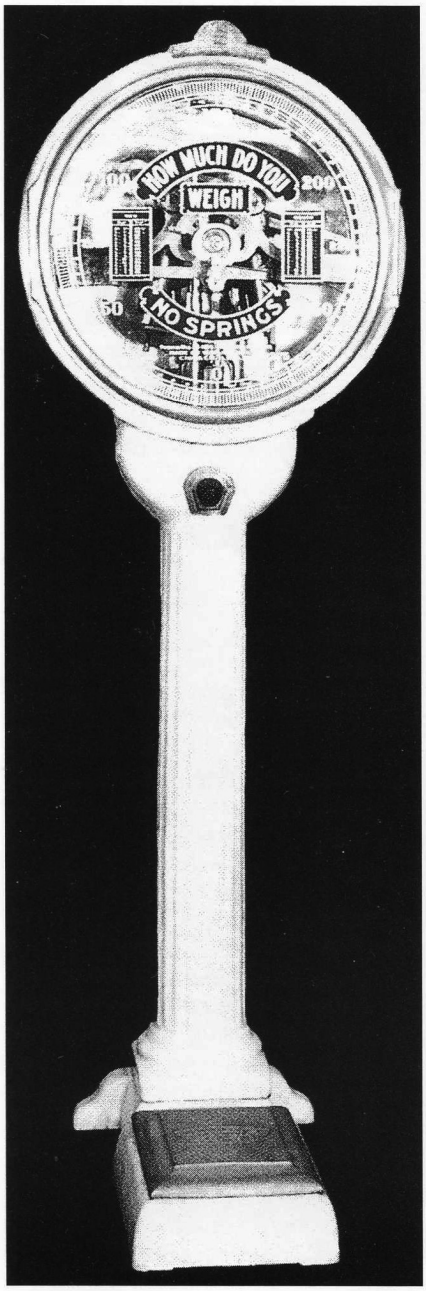


Fig. 11. ➢➢ Sheet one of the drawings for Tom Watling's US patent of 1914 for Watling's Coin Controlled Weighing Scale. Style One Springless Guessing Scale shows the "twin counter balance" mechanism of which he was so proud. He poured out publicity material relating to the superiority of his "twin counterbalance" machines.

Samuel G Crane, featured a randomly-rotating message-drum at the top of the dial face, electrified *to provide an advertising device operated as an auxiliary to the scale in which the advertisement is changed with each operation of the scale, and illuminated during the operation of the machine*. Unfortunately for Toledo, they saw the device as merely a means of advertising products in which the weighers might not be interested. Had the Toledo management been coin-op people and recognized this revolving drum for the Fortune Teller that it could have been, they might have overtaken the lead enjoyed by Watling, Caille, Mills, Jennings, and Novelty in coin-op market.



The Toledo Scale Company was to play yet another role. It was while working there as a mechanic that Meade fell in love with scales, particularly coin-ops, and began his collection.

How did I get into this? I've always tinkered with things, worked on cars, mainly. By the time I got to Toledo I had seen scales and played with them, but never really got into them. While there I worked on all kinds of scales—Toledo, Hobart, Stimpson, Fairbanks, Howe— and got the training necessary to make me a scale mechanic. I bought my first scale from an old man there for $10.00 and played with it. It was so fascinating that I kept going on and on. By the time I left Toledo, I had bought or salvaged a few scales, and become a scaleoholic.

Meanwhile, the custom of weighing in public became even more popular as the coin-op scale-makers continued to woo the weighers with a plethora of added inducements. People could gamble, collect photos of their favourite movie stars, learn their pulse rates or their fortunes, or play miniature golf, while

Fig 12. ➢➢ Watling Mfg. Co. was run by Tom Watling from 1914 to 1923 (his brother John starting up the Watling Scale Co. nearby in 1914). Tom applied for a patent for his Style One Springless Guessing Scale in 1914. By the summer of 1918 both the mechanism and the design had been streamlined. Where the earliest version had no access door at the front, making it very difficult to service, the later version, shown here, had the domed glass let into a door that gave access to the whole head. The three coin slots were moved to the center top and the whole of the column was used as a cash box, so that nearly $100.00 in pennies might await collection.

Courtesy W & J Berning

The DEATH KNELL Has Been Sounded for All Coin Operated SPRING Scales

Some makers of coin operated spring scales, in trying to put new life in their *dead* machines, have built them with the springs concealed in tubes and behind the mechanism frames of their *corpse* and have camouflaged the corpse by imitating or copying our large head copyrighted cabinet designs as near as they dared.

But to no avail, as the public refused to be humbugged any longer and insisted on getting their correct weight on a Genuine WATLING MFG. CO.'S Springless Scale.

MORAL: By all means insist on getting a WATLING MFG. CO.'S Springless Scale for the accommodation of your patrons.

WATLING MFG. CO.'S SPRINGLESS SCALES HAVE NO SPRINGS TO STRETCH OR BREAK, NO KNOBS TO PUSH, AND ARE NOT AFFECTED BY HEAT OR COLD.

No public place is complete without one or more WATLING MFG. CO.'S Springless Scales or Machines.

Write for printed matter and prices for our full line.

Our reputation of nearly forty years in this business is your guarantee.

Your money back if not satisfactory after thirty days' trial.

Fig 13 ⅄⅄ This advert, produced in the late 1920s, reiterates the claims that Watling constantly made. The price of their Big Head Lollipops was ony $25.00.

Courtesy W & J Berning

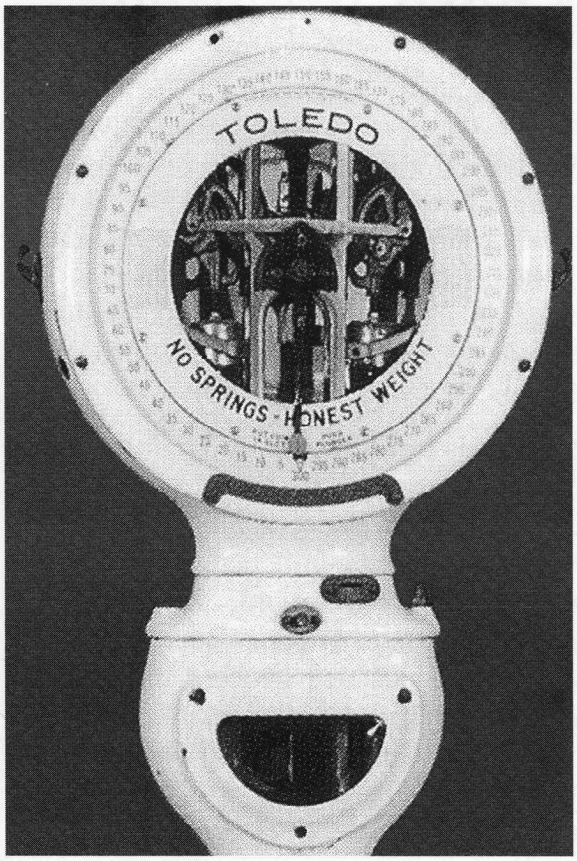


Fig. 14. ⅄⅄ Toledo no. 8300T, patented as a free weigher in 1915 and a coin-op in late 1919. Note the similarity to the Watling Style One Guessing Scale. Both pendulum scales made a feature of providing a large window so the viewer could watch the smooth action of the pendulums.

Courtesy W & J Berning

learning their weight. And all of this for a penny!

Part 3 in the next issue.

Notes & References

The sources for this article are so entwined that the article would be covered in end-note numbers if every fact was itemised. To save the readers, and the authors, we would like to acknowledge the immense help we got from W & J Berning, privately and from their book *Scales, a collector's guide*, from D Bueschel, privately and from his books *Big Head Lollipop Scales*, and from his *Collectors' Guide,* from the Taft Museum Catalogue called *The American Weigh* of the Christopher Steele collection, from Red Meade privately and from the catalogue of his collection prepared by James D Julia, and from various patent offices in America and Europe.

Individual assistance was given by the Museum of Racing at Saratoga Springs, on the Toledo 8300, and the final quote from Red Meade was originally published in *Coin Slot*, Spring 1991.

Person weights, c.1880

Steelyard person scales used proportional weights, in the ratio dictated by the steelyard and the levers under the platform together. These flat round brass weights are in the ratio 1:56. So the little weight that balances 1 stone actually weighs 4 oz. This weight, that balances 8 stone, actually weighs 32 oz, or 2lb, engraved by hand *112lbs, 8 Stone* on the rim, and *Young & Son, London* in the centre. Within it sits a fatter narrower 8 stone weight, then the 4 stone and 2 stone, all un-named, but the smallest weight, for 1 stone, is also engraved *Young & Son* in minute script. The scale is a low mahogany platform 5 ins high, with brass crescents let into the wood to indicate where the heels go. A short brass tube 7 ins tall, contains the linkage between the platform and the swivelling steelyard beam.

Sharp Practice

BY R BEARMAN

Thomas Sharp of Stratford-upon-Avon (1725-1799), known to readers of Equilibrium 1323-1326 as a maker of scales and weights, enjoys a more general notoriety as a pioneer in the very profitable business of selling souvenirs to unsuspecting visitors to Shakespeare's native town. These early tourists formed only a trickle in the early eighteenth century, but this changed dramatically in 1769 when a three-day celebration in honour of Shakespeare was held in the town, organised by the leading actor of the day, David Garrick. This brought fashionable London society into the town in large numbers and it was at this point that Stratford's history as a tourist town really began.

Sharp was baptised at Holy Trinity Church, Stratford, on 5 February 1725, the son of John and Mary Sharp. John, a clockmaker, was from Henley-in-Arden, six or seven miles north of Stratford. Thomas was apprenticed to his father's trade. In 1744 he opened an account book, a remarkable document which runs through into the 1780s. It mainly records agreements with local town and country folk to maintain their watches and clocks, but includes a similar contract with the Stratford Corporation and one or two entries for the cleaning of guns.

In 1756 an event took place which transformed the nature of his business. Shakespeare's retirement home in Stratford had been New Place, purchased in 1597, where he died in 1616. It stood in Chapel Street, on the corner of Chapel Lane, not far distant, in fact, from Sharp's own house on the opposite side of the road. By the 1750s its owners were generally sympathetic towards people interested in Shakespeare,

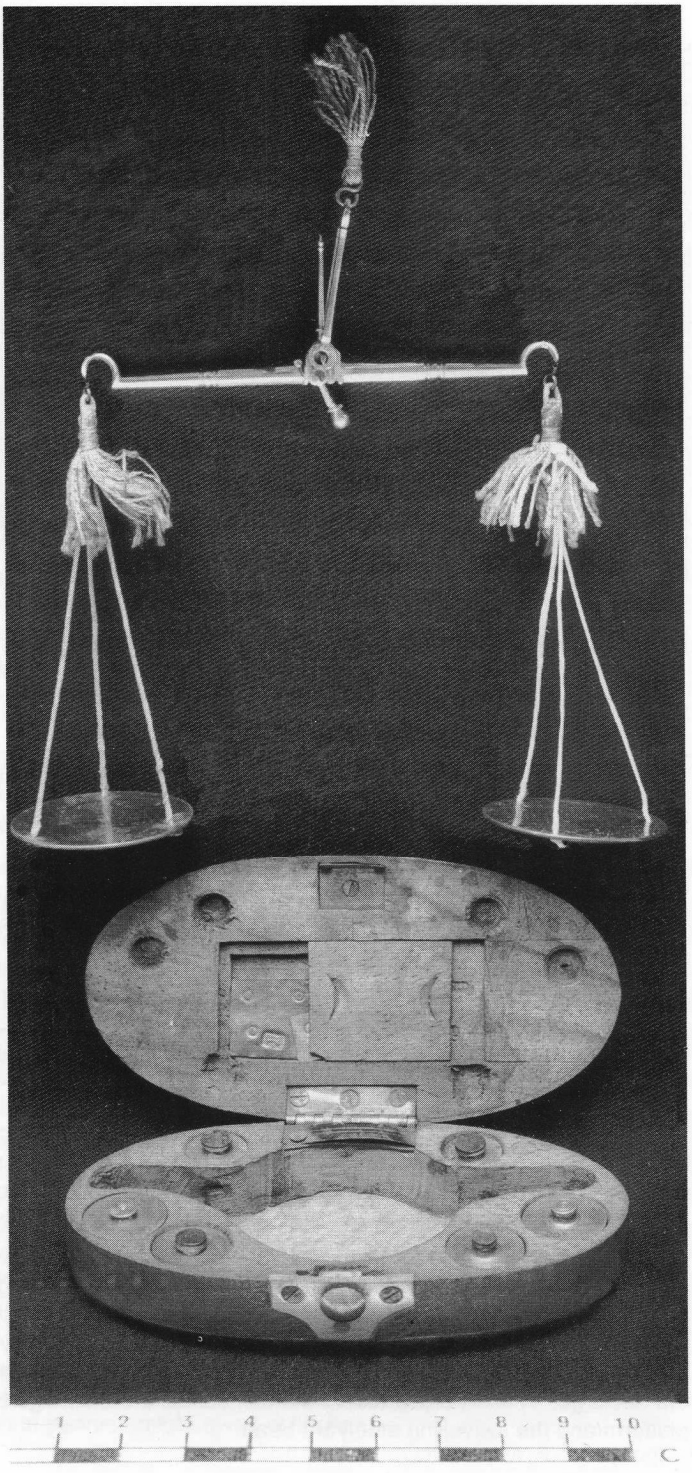


Fig 1. ➢➢ Sharp scales are consistent; all are oval, have a push-button catch, have round knobbed weights, have a sliding lidded locker for grain weights in the lid, have three screws holding each side of the hinge, and all are small. 90% have swan-neck ends on the beam, and about 50% have six weights, for old guineas (that could pass at the lower weights of 5.6, 2.14 and 1.7) as well as for the newly minted guineas that could only pass if they were over 5.8, 2.16 or 1.8. This one has replaced cotton cords and tassels (these are not the traditional green silk cords that were woven in a plait that did not kink or absorb moisture).

Courtesy Shakespeare Birthplace Trust, no. 812

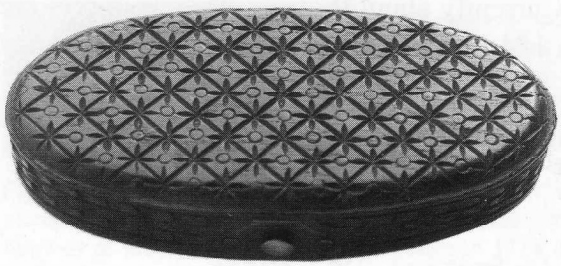


Fig. 2. ≺≺ Only Thomas Sharp decorated the underneath of boxes in such a decorative style. The depth of the carving is notable, yet the box feels silky to stroke. The sides of this box (which is shown in fig. 3), are carved to simulate basket-work.

but in that year the house, with its substantial garden grounds, was sold to the Reverend Francis Gastrell. Gastrell had no such generous an outlook, and committed, in the opinion of the local populace, two great crimes. In 1759 he pulled New Place down, almost in a fit of pique, it seems, brought on by a quarrel with the Corporation. He then left the town *amidst the rage and curses of its inhabitants*. But this had not been his only act of vandalism. Three years earlier he had cut down an ancient mulberry tree in the garden, planted, according to local folklore, by Shakespeare himself. Sharp, very astutely, stepped in and bought the felled timber, or the greater part of it, in the hope that it would have souvenir-value if cut up and fashioned into objects likely to appeal to visitors. He was not to be disappointed. As early as 1760, a lady visitor wrote *An honest silversmith bought the whole stack of wood, and now makes many odd things of this wood for the curious, some of which I hope to bring with me to town.*

This trade in mulberry wood relics soon became a target for sarcastic humour. The local headmaster, Joseph Greene, in a letter to a national newspaper, claimed that Sharp would even be willing, if asked, to make the editor a pair of crutches out of Shakespeare's mulberry tree. Garrick composed a facetious playlet featuring two rival mulberry wood carvers. One claims *It was I your honour bought all the mulberry tree, here's my affidavit of it.* The other one replies, *Yes you villain, but you sold it all two years ago, and you have purchased since more mulberry trees than would serve to hang your whole generation upon.*

This suspicion, that all was not quite as it should be, is reflected in local gossip. As early as 1768, Sharp was rumoured to have bought mulberry wood from wherever he could and then passed it off as part of Shakespeare's mulberry tree. Despite these criticisms, Sharp defended himself to the end, to the extent of signing an affidavit on his deathbed, in the presence of the major, that he had indeed bought the bulk of the mulberry tree; that he had worked it into many toys and articles; and that *he never had worked sold or substituted any other wood than what came from and was part of the said tree.*

By association, other trees which could somehow be linked to Shakespeare also acquired similar reputations. A walnut tree in front of Shakespeare's Birthplace was said to have vanished overnight during 1765, from the wood of which artifacts were manufactured soon afterwards.

Amongst the many items manufactured out of this mulberry wood were cases for weights and scales stamped with Sharp's name. The Shakespeare Birthplace holds two examples in walnut, stamped inside the lids with his name and the numbers 764 and 812 respectively. One had belonged to the then vicar of Stratford, Stephen Nason, and

Fig. 3. ≻≻ Variety of carving is another feature of Sharp's scale-boxes. This one has the mask of a man carved below the (unused) cartouche

Courtesy G Zavattoni

the other probably to Thomas Hunt, the town clerk. Currently about thirteen other examples are known, with numbers (where they exist) ranging from 184 to 812. One of these (no. 303) is dated 1776.

Owner	Carving	Plaque	No. of wts	Spring	Beam end	No.	Word stamp
D Vorley	Elaborate	Wm LEPPER Oxford Street no. 199	3 [missing]	Blued	Missing	?	SHAKESPEARS WOOD SHARP STRATFORD-ON-AVON
MHSO	Plain	Wm Phillips TETSWORTH Oxfordshire	6	None	Swan-neck	256	SHARP
Auction	Plain	?	6 [6 missing]	?	Swan-neck	184	SHARP
N Biggs	Plain	?	3	Blued	Swan-neck	698	SHARP STRATFORD-ON-AVON
G Zavattoni	Plain	None	3 [3 missing]	Blued	Box-end	No	SHAKESPEARS WOOD SHARP STRATFORD-ON-AVON
G Zavattoni	Elaborate	Not engraved	3 [1 missing]	None	Swan-neck	No	SHAKESPEARS WOOD SHARP
Australian	Plain	Willm Webb KINGSTON	6 [1 missing]	None	Swan-neck	205	SHARP
Crawforth	Plain	No plaque	6 [4 missing]	Blued	Swan-neck	235	SHARP
B Brass Garrick Club	Elaborate		3 [1 missing]	Blued	Swan-neck	No	SHAKESPEARS WOOD SHARP STRATFORD-ON-AVON
R Ladell	Plain	MATw FULLER HOUNSLOW MIDDLESEX	3 [3 missing]	None	Swan-neck	326	SHARP STRATFORD-ON-AVON
R Ladell	Plain	Thos Woods Mercer, Stratford on Avon	6 [6 missing]	Blued	Box-end	303	SHARP STRATFORD-ON-AVON 1776
RWilkinson							
SBT						764	
SBT			6	Blued		812	SHAKESPEARS WOOD SHARP STRATFORD-ON-AVON

In contemporary documents Sharp is variously described as a silversmith, clock and watchmaker, and a gunsmith. It is therefore unlikely that he had anything to do with the carving of the wood used in conjunction with these products.

A near contemporary, John Jordan, gives a more convincing account of exactly what happened. Speaking of the mulberry wood he says; *some was purchased by different people, inhabitants of Stratford, some of them out of veneration to the planter and some out of curiosity; among which number was George Cooper, a poor joiner of Stratford whose curiosity excited him to work what little he was able to purchase into toys such as tea-chests, boxes and tobacco stoppers etc some of which were prettily carved; but he, having a large family to support, could not purchase but a small part. Therefore, Mr Thomas Sharp, a silversmith of Stratford, who had purchased the most considerable part, and finding Cooper's goods went off pretty well, engaged him to work for him, and previous to the Jubilee in 1769, he employed another brother of Cooper's, who was by trade a shoemaker, but a very ingenious man, to carve toys for him, which he did in a very neat manner. The Jubilee coming on increased their value, and having a brisk trade he advanced their price, and by which he has acquired a pretty good fortune, while the poor carvers are in the most indifferent*

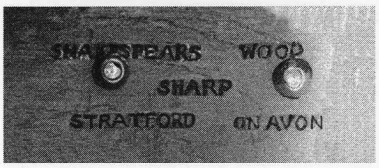
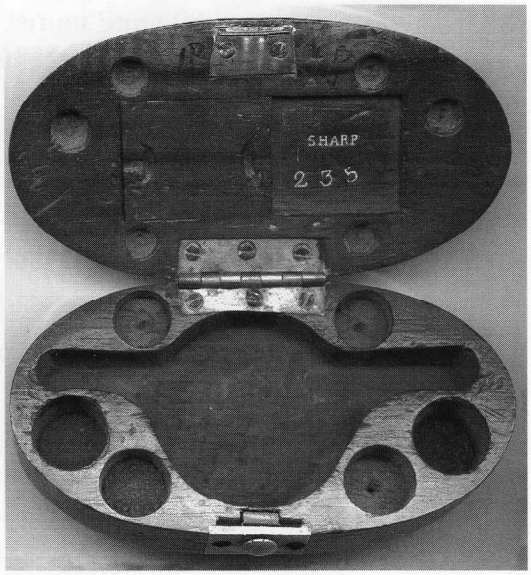


Fig. 4. ⋏⋏ Each word was stamped on individually, and each number of the three was stamped on separately. The words were always stamped into the wood behind the position taken by the grain locker-lid when it was open. The spelling of Shakespeare was not regularised until the 19th century, and Shakespear is one spelling used by Shakespeare himself.

Fig. 5. ➢➢ Sharp makes no claim, on this box, to have made it from 'Shakespear's wood', even though it was made very early on in the sequence. Because it has holes for six weights, presumably it was made between 1774 and 1776. The locker lid fits superbly, just sliding along its grooves. How did the maker get the lid into the grooves? Originally the hinge had a blued steel spring held on by the middle lower screw, to force the box to open very slightly when it was clipped shut. This kept the catch engaged.



circumstances. Jordan, it must be said, also stands accused of taking advantage of gullible tourists, but his story can be corroborated, in part at least, from other sources: above all a beautifully-worked tea caddy recently bought by the Victoria and Albert Museum, dated 1759 and stamped with George Cooper's name. Clearly, then, he had the necessary skill to have gone onto Sharp's payroll to help in the necessary fabrication of mulberry tree relics. Nor is it by any means certain that Sharp made the balances either. These might well have been bought in from elsewhere, making Sharp's role one of overseeing the assembly of other craftsmen's work into commemorative items likely to appeal to the Shakespeare enthusiast.

Sharp died in October 1799, and was succeeded in his trade by his son, John. According to his contemporary, Robert Bell Wheler (Stratford's first historian) John junior was an excellent workman *but very wild having enlisted in different regiments several times and was often bought off by his father which considerably impoverished him*. This is borne out by one of Sharp's notes in his account book, under the year 1769: *son John went away without leave to enrol as a soldier in the Queen's Regiment of Dragoons*. So although high society may have made fun of Sharp's souvenir business, and although Stratford folk were quick to point out how much he had profiteered out of his purchase of Shakespeare's mulberry tree, it may, in fact, have been necessity

Fig. 6. ⋖⋖ The knobbed brass weights have 5.8 and 2.16 stamped on their tops, and, additionally, have D5 G8 and D2 G16 stamped underneath, a feature only seen on Sharp's weights. [For the non-mathematical, 24 grains make 1 dwt.]

Fig. 7. ➢➢ Sharp usually made simple shears but this beam has the more elaborate shears with two holes in the 'doll's head' (as Sheppard & Musham called it).

All six weights have survived, as have the spun copper pans with their turned-down rims (to give extra rigidity to the thin metal). Sharp used extra-large pendants on all his beams, some of them of blued-steel.

Courtesy Museum of the History of Science, Oxford

which drove him into cultivating tourist patronage in the way he did. What is more, we are not looking at souvenirs as we now know them, but wonderful items of craftsmanship which can still give us pleasure today.

Author's Biography

Robert Bearman is the Senior Archivist of the Shakespeare Birthplace Trust in Stratford-upon-Avon. He gave a talk, on which this paper is based, to ISASC Europe at the meeting held in October 1999.

The Grocer

BY G NEWALL

Supermarkets have destroyed so many of our smaller shops with their friendly shopkeepers that certain aspects of retail business would appear strange to present-day children. I can't remember the last time I was in a butcher's or grocer's shop where the floor was liberally sawdusted. If you were lucky enough to arrive at such a shop at opening time, you may have seen the work of one of the more artistic exponents raking an intricate pattern in the sawdust for his own pleasure mainly which, after the first few customers, would have disappeared completely.

Fig. 1. ⩓⩓ Chas W Brecknell Ltd catalogue 1936. Brass agate beam scales, capacity up to 4lb. These were supplied to grocers with either curved pans or scoops for more expensive dry goods like tea, sultanas and sweets.

Large grocers received their stock in bulk; butter in casks, cheeses in muslin, sugar in hessian sacks, tea in plywood chests; flour, salt, coffee, dried peas in sacks; hams and sides of bacon wrapped in sacking; vinegar by the barrel. Tinned goods came in cardboard boxes much as they do now, as did wines and spirits, tobacco, cigarettes, boot polish, jam, matches and all the other goods.

It was for the younger members of staff to repack the sugar into the blue-paper 4lb sugar-bags, the tea into packets, flour into bags of one or fi stone. Dried fruit was usually in 1lb bags. The vinegar barrel had a tap knocked into it and was set on a tilt ready for use. Butter was set on a white porcelain stand and an assistant would cut horizontal slices with a wire before cutting the smaller pieces with a knife to obtain the desired weight and then shaping it with the wooden butter pats.

Bacon was cut as required. The customer selected one from perhaps five or six sides, and maybe two rolls on display stands, whereupon it was placed on the bacon slicer. If the assistant had forgotten the thickness preferred by the

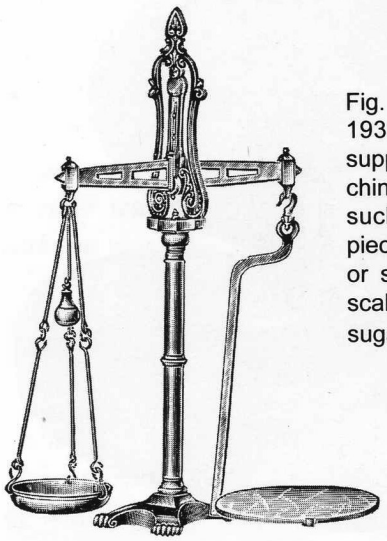


Fig. 2. ⩔⩔ Brecknell's 1936 provision scale, supplied, as shown, with a china scale for moist goods such as meat or large pieces of cheese or butter, or supplied with a biggish scale for dry goods such as sugar or flour.

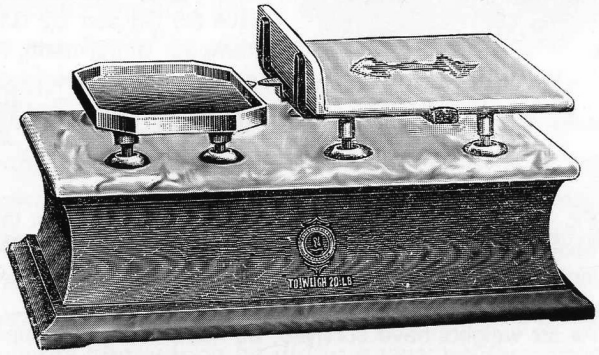
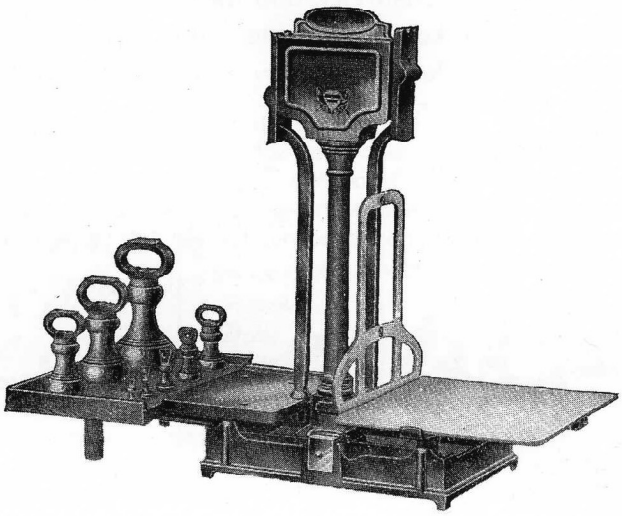


Fig. 3. ⩓⩓ Brecknell's 1936 Beranger scale, suitable for cheese, bacon or large cubes of butter.

Fig. 4. ⅄⅄ The grocer had his bacon slicer on his right and his Herbert's inverted roberval scale with brass bell weights on his left. This side of the shop was lined with ceramic tiles, easily washed, and a marble slab as the counter, cool and easily scrubbed. The sides of bacon were hung on hooks above his head for future use, and piled on the shelf for immediate use. The customer had a bentwood chair provided.

Fig. 5. ⅄⅄ Brecknell's 1936 Imperial scale, an inverted roberval with a weight stand bolted on to the frame of the scale. The plain top is very staid compared with the lively lion above, the seated bull on P Rogers', the elaborate coat of arms on Avery's, the snorting bull on Day & Millward's or the twirled lances on Carnegie & Layton's Imperial machines,

customer, he asked, "What number, please?" and the machine was set to produce slices of the required thickness. The ubiquitous red Berkel seemed to have a range from 1 to 20 but numbers 8 to 14 seemed to be the most commonly used.



The grocer knew his stock and most of his customers, and if appropriate he would mention to a regular customer, "That's a particularly good side of Ayrshire" or, "I can't recommend the Leicester cheese this week, it seems to me a bit dry".

Fig. 6. ≺≺ Brecknell's 1936 semi-automatic scale, readable from the customer's view as well as from the grocer's view. Smaller versions went up to 4lb capacity, but this went up to a maximum of 20lb capacity. These fan scales were still relatively uncommon in 1936, but were very popular by the 1950s and 1960s. The chart gave the price of up to 1-lb of the goods at various prices, so the grocer had to work out the price of the full pounds of the goods, using weights on the chrome pan, and then add on the price shown on the chart. The use of white enamel made this an eye-catching scale in the relatively dim shop, and hinted at exceptional cleanliness.

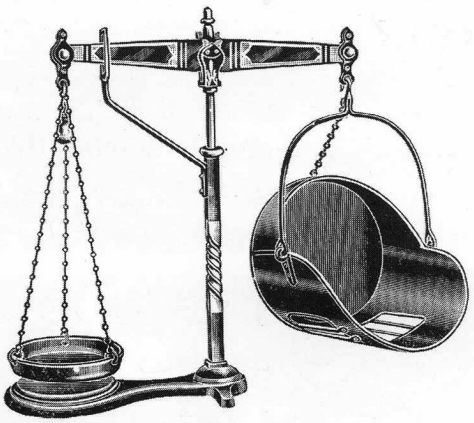


Fig. 7. ⩓⩓ Brecknell's 1936 potato beam scale finished in black and gold, in the traditional way. The barley-sugar twist on the pillar was very typical of blacksmith's work. The nose guard was a sensible addition, as potatoes were tumbled roughly out of the huge bag to land with a crash in the scoop. Note the sieve in the bottom of the scoop, to let out the drier soil before weighing. Note also the chain attached to the back of the scoop, to prevent its tipping over backwards.

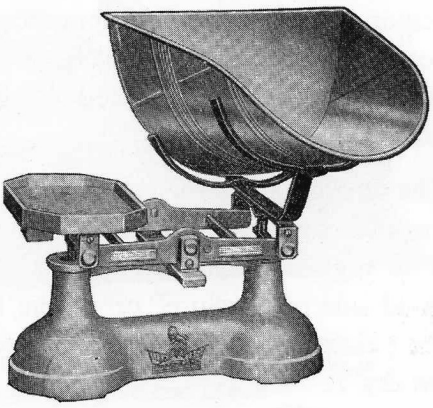
The customers' goods were assembled on the mahogany counter, the cost totted up with no more help than a paper and pencil, and when paid for, would be stacked neatly into the customer's bag or basket, or wrapped in brown paper and tied with string.

Scale maintenance in such shops was usually one of the more pleasant jobs. Obviously attendance had to be made on a day of the week that suited the grocer, but that was generally known.

Six or eight scales in the front shop were not uncommon, most of them brass beam [equal-arm not steelyard] scales. In the rear there could be two or three beam scales, half a dozen counter scales, a sack scale and perhaps a 5cwt capacity platform machine. There was always a bench to work on and a cup of tea was provided at mid-morning and also at lunchtime if sandwiches were eaten there. Sugar was not always provided but it didn't take long to learn that the point of a pencil pushed into a hessian sack caused a little spout of sugar which was just as easily stopped by rubbing and left no trace.

One at a time the scales were dismantled, knife-edges and bearings examined and cleaned up where necessary, before being re-assembled and tested to ensure that they were within the allowance permitted. Over the years, as wear took place, adjustments were required to maintain accuracy and sensitivity, and these were continued until the time came when work on site was insufficient to keep a machine within the law. It was then a case of taking the scale into the scale-makers' workshop where it would be overhauled and restamped before being returned to service.

Fig. 8. ⩔⩔ The last three illustrations are of the type of scales more usually found in the rear of the shop, where they needed robust scales to reliably stay true. Brecknell's 1936 heavy pattern counter scale was perhaps a bit too smart for the rear, but, if it had done many years of duty in the front, it might be moved into the rear until the workshop could do no more and the inspector condemned it.



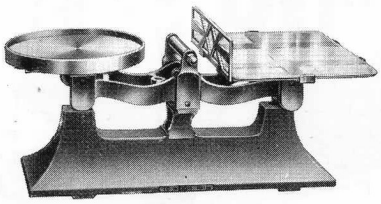


Fig. 9. ➢➢ Brecknell's 1936 vibrating counter machine, very useful for weighing out flour, porridge oats or animal feed. In fashionable green and gold, or glossy gold.

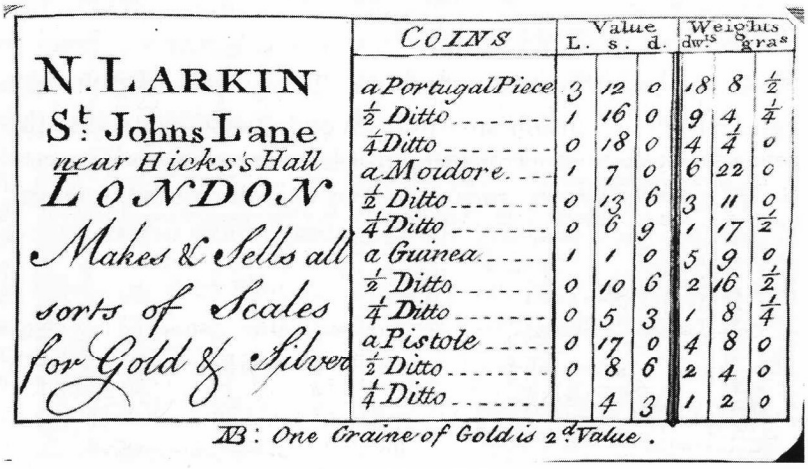
Mechanical scales could, and often did, last a long time, and within the last six months I have seen self-indicating scales from the 1920s and 1930s still in use on shop-counters. I have sometimes wondered how many of those who bought and those who used the machines, appreciated the design, construction and maintenance that enabled them to use a scale day after day for decades, sublimely confident that it remained utterly trustworthy. But then, I'm a sentimental old fool!

Editor: Geoff Newall may consider that the scales illustrated pre-date him by a fair bit, but designs stagnated during the Second World War, and scales were carefully repaired by people like Geoff, to prolong their useful life.

French Grocer, c.1880

Trade Card, c.1765

Nothing is known of N Larkin, but his working date can be deduced from the fact that he has included the quarter guineas (minted in 1762) neatly in the middle of his list of coins, so the card must have been first designed after 1762. However he gives the weight of the guinea as 5.9, the full weight, not the legal minimum, 5.8, that was made current after 1774. He includes the French pistole, a coin that faded from use by about 1750, although it still turned up occasionally. Compare the card with the Colonial American trade cards of the same period shown on pages 2472-2475.



N. LARKIN
St. Johns Lane
near Hicks's Hall
LONDON
Makes & Sells all
sorts of Scales
for Gold & Silver

COINS	Value L.	s.	d.	Weights dwts	grs
a Portugal Piece	3	12	0	18	8 ½
½ Ditto	1	16	0	9	4 ¼
¼ Ditto	0	18	0	4	4 0
a Moidore	1	7	0	6	22 0
½ Ditto	0	13	6	3	11 0 ½
¼ Ditto	0	6	9	1	17 ½
a Guinea	1	1	0	5	9 0
½ Ditto	0	10	6	2	16 ½
¼ Ditto	0	5	3	1	8 ¼
a Pistole	0	17	0	4	8 0
½ Ditto	0	8	6	2	4 0
¼ Ditto		4	3	1	2 0

NB: One Graine of Gold is 2d Value.

Old Tenor-New Tenor-Again

BY E P MAHONEY

A long-standing error may now be corrected. In their classic 1923 work *Money Scales and Weights*,[1] Sheppard and Musham described a coin scale-box having *a rectangular tapering balance beam decorated in three incised lines on each link* [arm] *and canted upper edges.* The rectangular oak case had two pens for weights; the weights were missing. Inside was a label that identified the seller as *Lewis Deblois at ye Golden Eagle dock Lo*[ndon] and listed the weights and values of all the coins in use at that time, which they believed to be 1740. But the values were listed for 15 coins in Old Tenor and Full Lawfull [money], and bullion weights were defined in Gold Old Tenor, and Silver Old Tenor. Clearly these were not English coins or currency. Why would a London merchant sell a scale with such a label?

In his informative article *Old Tenor*[2] the late George Mallis describes his good fortune in acquiring an apparently identical scale having weights inscribed with the 'lion passant' assay mark of Goldsmiths Hall in London. The table of contemporary weights was identical to that in Sheppard and Musham except that the name of the seller was R Billings in Cornhill, Bofton (the old-fashioned long *s* is often mistaken for an *f.)*

Coins	Weight oz. dwt. gr.	Value Old Tenor	Full Law full	Weight oz. dwt. gram.	Gold Old Tenor	Silver Old Tenor
A Guinea.....	5 9	10 10 0	28/ -	1	38 0 0	2 10 0
A Half Guinea ...	2 16 4/24	5 5 0	14/ -	10	19	1 5
A Moidore.....	6 22 1-3/4	13 10 0	36/ -	5	10	12 6
A 4 Pistole ps....	17 8	33	88/ -	4	12	10 6
A 2 Pistole ps....	8 16	16 10	44/ -	3	14	7 6
A 1 Pistole ps....	4 8	8 5	22/ -	2	3 16	5
A 3.12 Sterg or.. a double Johannis.	18 10	36	96/ -	1	1 18	2 6
A 36/- Sterg ps...	9 5	18	48/ -	12	19	1 3
A 18/- Sterg ps...	4 14 1/2	9	24/ -	6	9 6	7 1/2
A 9/- Sterg ps....	2 7 1/4	4 10	12/ -	3	4 9	3 3/4
A Crown.....	19 8 1/2	2 10	6/ -	2	3 2	2 1/4
A Dollar	17 12	2 5	6/ -	1	1 7	1 1/8
A Half Dollar....	8 18	1 2 6	3/ -			
A Quar. Dollar...	4 9	11 3	1/6			

N. B. 24 Grains to a penny Wt. 20 pen. 1 oz. Sold. by Lewis Deblois at ye Golden Eagle dock Lo.

Fig. 1. ⋏⋏ Lewis Deblois' label copied out by Sheppard and Musham. It seems possible that this trade card looked similar to fig. 5. 'Sterg ps' is Sterling piece abbreviated. The 36/- sterling piece referred to is a single Johannes, a Portuguese coin.

During a visit to the American Antiquarian Society,[3] Mallis learned that R Billings was a merchant in Corn Hill, Boston, from 1735, and that the sale of items such as scales would certainly have been within his sphere of business. By consulting E P Newman's monumental work *The Early Paper Money of America*[4] he learned that, beginning in 1690 and continuing through 1741, the Massachusetts Bay Colony released several issues of paper money called Tenor. The earliest issue eventually became known as Old Tenor.

Obviously, the Billings' scale was intended to be sold in Massachusetts. Why then, would the Sheppard and Musham scale with a nearly identical label (except for the name of the seller) have been sold by a London merchant? Perhaps the secret could be found in investigation of the engravers, who made the labels.

A visit to the Winterthur Museum Library[5] provided the answer. The writer located a reference (given by F G Fales in an article on engravers[6]) that led to the trade card shown in Fig. 3. The use

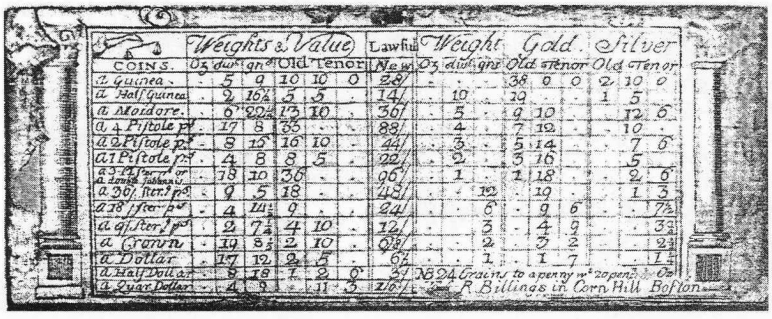


Fig 2. ⋖⋖ Richard Billings' label in the scale box owned by Mallis. Note that the values on this label are identical to those in fig. 1, indicating that the scales were sold in the same period. There is nothing to show the customer what shop-sign to look out for. Their shop was at 10 & 11 Corn Hill, proving that Boston had numbers at least 25 years before London had them. Note that the picture has been computer-enhanced.

Fig. 3. ⩓ Lewis Deblois trade card/bill head engraved in 1757, in the high style favoured by London tradesmen around 1750. Note that the shop has a board above the front-door with his name and other, illegible writing underneath the name. The shop sign is prominently displayed on a pillar on the sidewalk. The eagle has his tongue out!

of one card to cover two uses, trade card and bill head, was common in the 18th century.[7] The bill or receipt was frequently written on the reverse of the card.

This remarkable engraving by Thomas Johnston holds the answer to many questions. It confirms that Lewis Deblois at the Golden Eagle on Dock Square, Boston, *...imports every spring and fall from London...* a great assortment of wares... *which if enumerated here would be tedious for the Reader.* His place of business is shown with, out in front, its shop sign of the Golden Eagle perched on a column. However, since Lewis Deblois' name, the Golden Eagle, and London, are all in large type while the word Boston, although mentioned three times, is in smaller type and partially obscured by the border designs and the surrounding copy, it is quite possible that a casual reader of the card (such as Sheppard or Musham) would assume London was Deblois' location.

Additional proof that Deblois was a Boston merchant is offered in *U. S. Coin Scales and Mechanical Counterfeit Coin Detectors* by Newman and Mallis.[8] In their chapter on equal-arm balances of the Colonial and Pre-1857 period they include the Billings' scale owned by Mallis, and then add this tantalizing information*: a similar pocket scale in a rectangular wood box made without weight compartments, but with identical tables on the label, carries the name of Lewis*

Deblois Golden Eagle dock Sq *(Boston) as seller and the name of Thomas Johnston of Boston as engraver of the label.*

In recent correspondence Newman has provided the following insights into that scale and its label, one of three in his collection, and suggests a reason for Sheppard and Musham's original error. *It was an English custom brought to America to name a place, pub, or store after a symbol or emblem. The Golden Eagle is such a symbol for the store. Joseph Thompson of Boston, the engraver, appears to have done a rather careless job on my label. It reads 'at ye Golden Eagle dock Sq.' There is no comma between 'Eagle' and 'dock.' 'Dock' should be capitalized. The 'Sq' looks like 'La,' as the long 's'; is used and the tail of the 'q'; is worn off. It seems likely that those authors saw this label or one like it.*"

A few additional items concerning the Billings and Deblois families may be of interest. In records of the Boston Selectmen[9] dated August 15, 1739, Mr. Richard Billings, *in behalf of himself and his brother John Billings, desires to hire the two shops in Dock Square, in their present occupation, numbers ten and eleven.* On October 10, 1739 the same records show that the Selectmen executed a lease of two shops on Dock Square, numbers ten and eleven, to *John and Richard Billings, Tailors, for the term of five years commencing the first of September last past, for the annual rent of Sixty Pounds to be paid to the Town Treasurer at four payments quarterly, and upon such other Conditions, as in the said lease is expressed.* Cornhill Street ran across this area, and an undated reference to Dock Square records a Billings' location to the north of Cornhill.

On May 8, 1754 Gilbert and Lewis Deblois presented a petition to the Boston Selectmen that a part of *Queen-Street may be widened, or a Lease granted them of the Town's Shops there, on such terms as may be thought reasonable.* The land referred to was a piece bounded on one side on Hanover Street and on another by Queen Street at a location

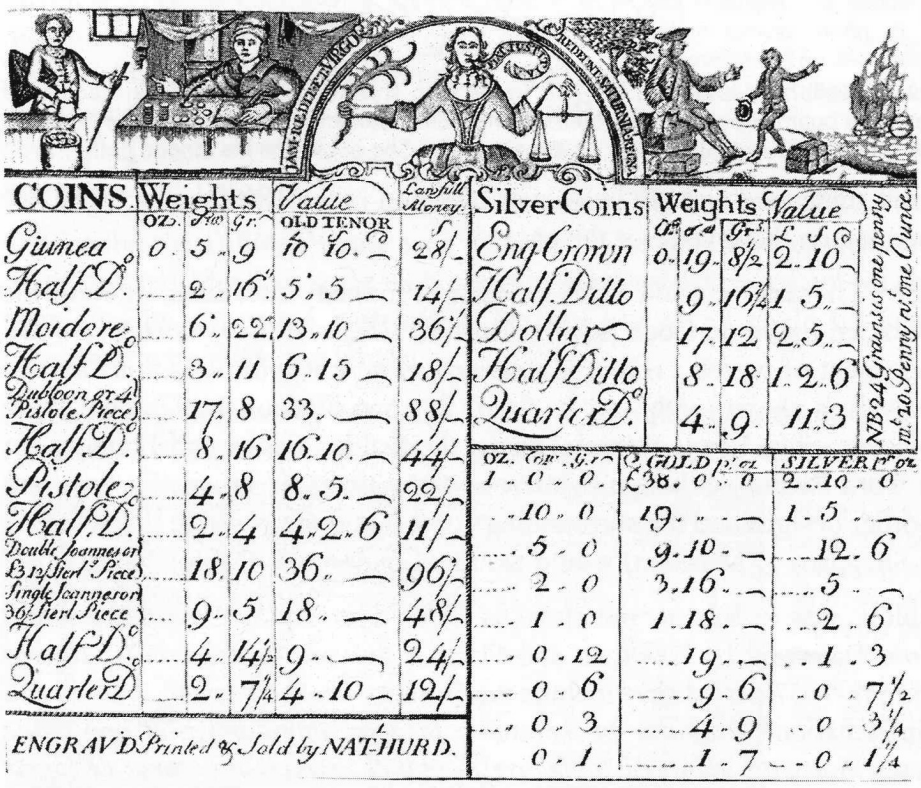


Fig. 4. ≺≺ Nathaniel Hurd's label. Hurd's shop-sign was probably Justice with scales. Hurd packed his pictures with ref-erences to metrology. The man on the left, with his tricorn hat under his arm, has a bag of money in his right hand, and, in his left hand, a striker for the measure in the foreground. The man at the table has an account book and piles of coins. The merchant sitting under the tree, on the right of Justice, is surrounded by bales of goods, and the captain to whom he is talking, gestures towards his ship. The chart gives the weight and value of gold coins and silver coins, the value of the gold being given in Old Tenor and Lawfull Money [New Tenor] and the silver in Old Tenor only. Compare this chart with that of Joseph Richardson of Philadelphia, EQM 1490. The proportions are not what you would expect in a scale-box. Again, this card has been computer-enhanced and may be slightly different from the original.

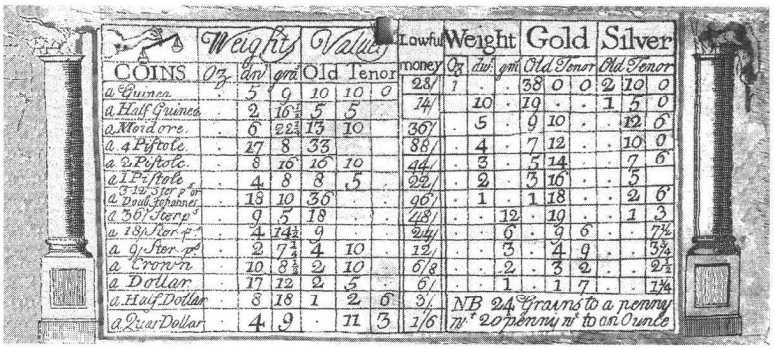


Fig. .5 ➢➢ An anonymous trade card, which could be stuck into the box of any coin-scale imported. Computer-enhanced.

where Queen Street is narrow. *The Memorial History of Boston*[10] refers to Gilbert and Louis Deblois as *braziers on Hanover Street.*

To illustrate the close connections of individuals in Boston trade during colonial times, Boston-born Nathaniel Hurd (1730-1777) engraved more than 38 bookplates, one of them for Lewis Deblois, in Jacobean style. Hurd also engraved an ornate Old Tenor-New Tenor chart with the same data, shown here as Fig. 4, which is reported to have been made about 1765.[11] This chart is illustrated in *Arts and Crafts* and *Early American Silver.*[6]

As to Old Tenor conversion labels, the writer has one which is very similar to the Billings' as reported by Mallis, differing primarily in graphic differences but with all data in the same arrangement. The engraved structural columns on the writer's copy are similar to the Billings' example but the wear of the label is such that there is no evidence of decorative scrolls on the top of the label and the drapes at the tops of the columns are similar but do differ, as do other graphic features of the engraving.[12] A curator at the Massachusetts Historical Society[13] stated that Colonial copper-plate engravings were often copied from a sample in a short time, and profit could be earned by the engraver-printer with surprisingly small editions of as few as one hundred pieces.

And, you might ask, what was the need for Old Tenor conversion charts in 1765 when the initial date for redemption of revalued Old Tenor was 1750? Nonetheless, Old Tenor bills continued to circulate. According to Newman, beginning in 1749/50 and continuing until the American Revolution in 1776, the ratio of Old Tenor to Lawful Money (New Tenor) was seven and a half to one. As late as April 1766 the records of Trinity Church, Boston, show that *by cash received from Easter 1765 to Easter 1766 being the contribution for 51 Sundays, 2116 Pounds Six Shillings and Eight Pence Old Tenor was rendered as current 282 Pounds Three Shillings Seven Pence* and thus conforms to that established rate.[14] On all the charts known to Newman, the gold and silver values in Old Tenor relate to the weight units in the column to their immediate left (rather than to the coin weights listed on the far left) thereby dating the sale of those scales to that period.

We need no longer ponder the cryptic reference to the Deblois label in Sheppard and Musham. Collectors who have the book may wish to note Deblois' correct location is Boston, not London, and also the proper dating of the label is 1749/50 or soon thereafter.

Many of the scales Sheppard and Musham saw prior to 1922 were destroyed during the Second World War, making their record, although incomplete, of great value to historians. While this account contributes to that record, it by no means exhausts the information that must be available concerning Old Tenor and related labels. The writer or one of the editors would be very happy to hear from any readers with additional data to offer.

Notes and References

1 Sheppard, T & Musham.J., *Money Scales and Weights*, Spink & Sons, London, 1920-23, reprint 1975, p 41.

2 Mallis, A G, Old Tenor, *Equilibrium,* 356-60.

3 American Antiquarian Society in Worcester, Massachusetts.

4 Newman, E P, *The Early Paper Money of America*, Iola, Wisconsin, 1967, 1976, 1990, & 1999.

5 Winterthur Museum Library near Wilmington, Delaware. Neville Thompson, their most gracious and adept

librarian, assisted the author.

6 Fales, M G, *Early American Silver*, N.Y. E.P. Dutton & Co., Inc. 1973; *Coin World,* May, 1970

7 Hitchings, S, Thomas Johnson in *Boston Printers and Printmakers 1670-1775.* The article refers to Lewis Deblois at the Golden Eagle, trade card [copperplate engraving] by Thomas Johnston, 1757 [held by] the Henry Francis du Pont Winterthur Museum, Joseph Downs' Manuscript collection No. 66X152 [p. 104].

8 Newman, E P, & Mallis, A G, *United States Coins Scales and Counterfeit Con Detectors*, 1999. Ch. III, sec. I, no. 3.

9 *Records of the Boston Selectmens' Minutes*, various dates. See EQM p 1858.

10 Winsor, J. *Memorial History of Boston 1881.*

11 Fincham, H W, *The Artists and Engravers of British and American Book Plates*, London, Kegan Paul, 1897.

12 Mallis, A G, American Counterfeit Coin Detectors, *Equilibrium*, 12-15.

13 The Records of Trinity Church, Boston.

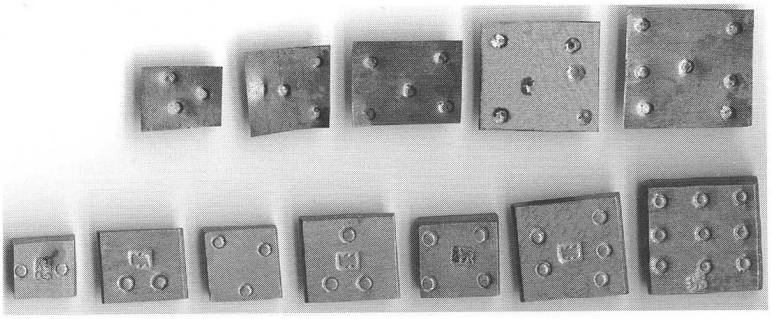
14 Massachusetts Historical Society in Boston. A curator kindly shared this knowledge in 1992.

Author's biography

During his years of teaching mathematics to seventh graders, Eugene P. Mahoney developed a strong interest in English coins of the American colonial period, 1607-1776. After his retirement he expanded his interest to include the scales, weights, and measures of the British colonies in America. An avid researcher, he has contributed several previous articles to Equilibrium. Much of his work has been done at the Winterthur Library and Museum in Wilmington, Delaware, with whom he has exchanged information from his own research in return for library privilgeges. With Gary Batz, he is currently developing a program whereby ISASC members will be encouraged to combine their findings with one another with the ultimate aim of publication.

Pennyweights and Grains

If coins had to be weighed, the easy method was to put the correct coin-weight on one pan, and add the sheet grain weights to the coin until the scale balanced, then calculate the loss at 2d per grain. If no coin-weights were available, pennyweights (the lower set) were put into one pan with the correct number of grains, as specified on the label for that coin, and then continued with the method above, altogether more fiddly.



Person scales into Bay

FROM RED MEADE

Weights and Measures inspectors in Los Angeles were very keen to demonstrate their careful watch over traders. When they pushed more than 7000 condemned scales into the water outside the breakwater off Long Beach, they invited the press to photograph the event. They put a label on a coin-op person scale stating SHORT WEIGHT MEANS SHORT LIVED BUSINESS. Another label stated that I STOLE 12 CENTS IN EVERY DOLLAR. Red often refered to the astounding numbers of scales that he saw being destroyed during his working life, and deeply regretted the loss of so many fascinating scales.

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EQUILIBRIUM®

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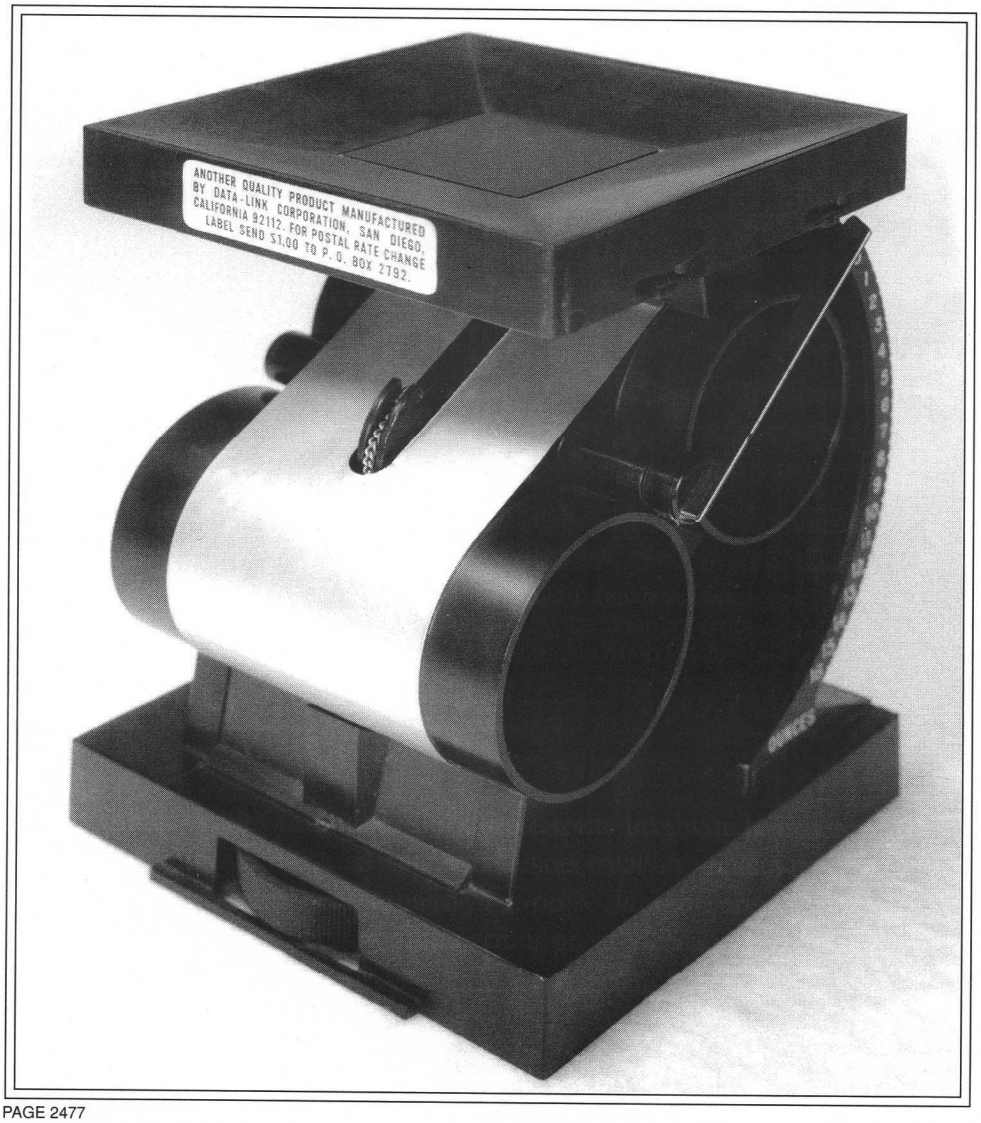

Cover Picture

This plastic letter scale was only made in about 1972, so why is its rear view shown on the cover of EQM? The mechanism is truly unusual (unique is an over-used word, but maybe here it is, for once, appropriate!) For a full description read the article on the Rolamite on pages 2500-2505.

The scale is an eccentrically-mounted "tower" of bits, with a pointer that arcs past the edge of the graduated chart (behind the tower as seen from this angle). The chart is a separate sheet of plastic, attached to the base but not attached to the tower at any point.

The striking feature is that the scale is held into the air by the spring (hidden between the fine chain wrapped round the cam just visible in the slot in the silvery plastic band, and the tare screw at the bottom of the base). The upper cylinder and the letter-plate secured to the upper cylinder would fall if the spring was not pulling against the cam continuously. In other words, this scale has no point of equilibrium. This lack of equilibrium is shared by the German postal scale in which the magnets are attracting continuously, but there are few other examples.

The label on the rear of the letter-plate says ANOTHER QUALITY PRODUCT MANUFACTURED BY DATA-LINK CORPORATION, SAN DIEGO, CALIFORNIA 92112. FOR POSTAL RATE CHANGE LABEL SEND $1.00 TO P.O. BOX 2792. The scale is $5^{3}/_{10}$ ins high, and $4^{4}/_{10}$ ins square.

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INTERNATIONAL SOCIETY OF ANTIQUE SCALE COLLECTORS

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"Béranger

BY M HEITZLER

An Early Roberval Counter Scale by Béranger

Last summer, I was lucky enough to find this large counter scale which is the most remarkable French roberval I ever saw. The quality of the materials, the high quality of the workmanship, and the unusual technical design combine to give a bright item for collectors.

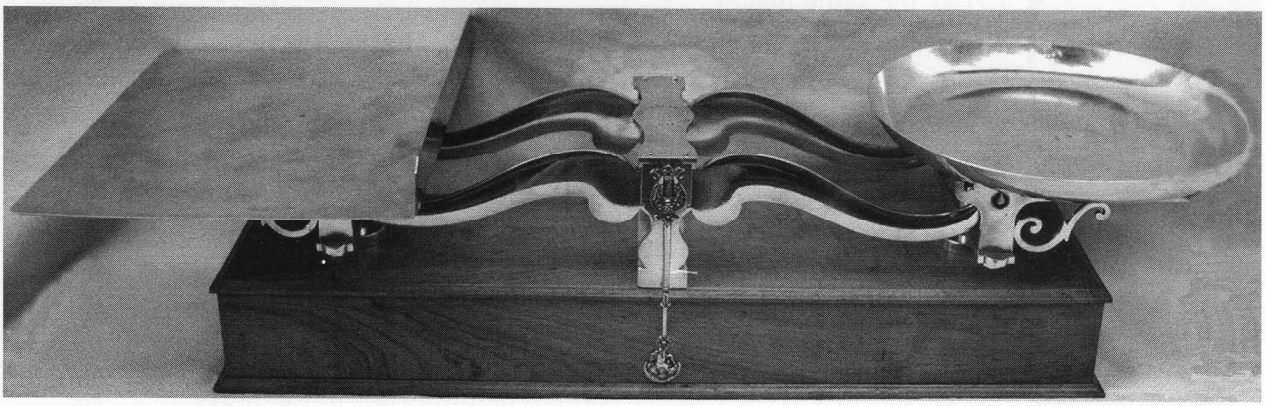


Fig 1. ⩓⩓ Characteristics:
Dimensions: total length 915mm, total width 350mm, total height 207mm. Pans: one circular, diameter 300mm (12ins), the other rectangular, 285 x 350mm.
Weighing capacity: not indicated but according to the round pan's size, it could be 30 kg (probably the maximum in the range for that model, see fig. 12).
Condition: very good, except one of the four pegs is missing under the circular pan (this alters equilibrium) and the front bearings of the stay, which had to be repaired (see note 5).

One can guess, from the maker's name and date BÉRANGER ET C^ie à Lyon 1844, that it has some historical interest: I knew that some roberval scales by Béranger were accepted by the Weights and Measures Administration but I didn't know what they looked like. Happily, two weeks after finding this scale, I had the opportunity to buy a book written by Giraud[1] which offered much information on Béranger's production[2] and gave me some idea about the birth of this model.

Let's first examine what makes it original in relation to common roberval scales.
- All pieces are made of brass, (except knifes and bearings,[3] knife-edges and stays).
- These pieces have a thickness varying from 5 to 9mm and each is numbered or marked by one or several points on screws and nuts.
- The volute-shaped beam (fig 4) is a *twin* beam, which used to be very rare in France, contrary to United Kingdom practice.[4] The cradles with their device for fixing the pans (fig 2)

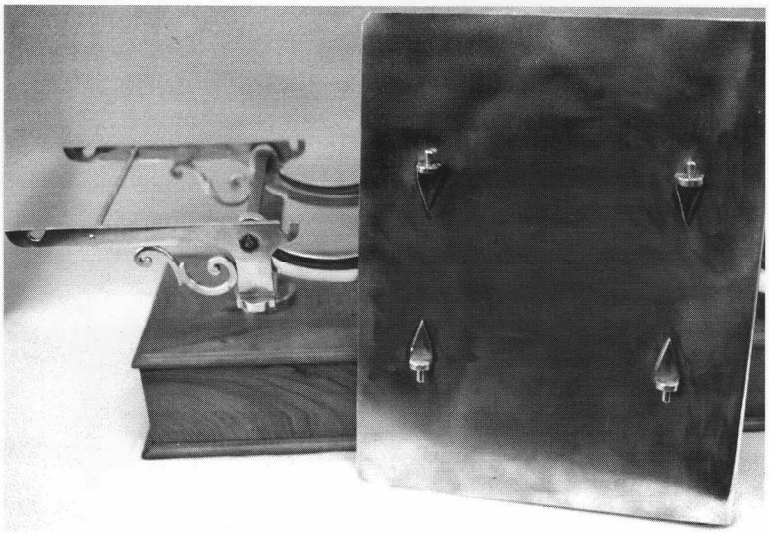


Fig. 2. ➢➢ The plate removed to give a clear view of the elegant brackets and of the bearings for the knives. Note the end of the beam, so far to the right of the centre of the plate. Note also the decorative tabs holding the knives under the plate.

Fig. 3 ≺≺ Detail of cross-brace showing date and makers' name and town. BÉRANGER ET C^{ie} à Lyon 1844.

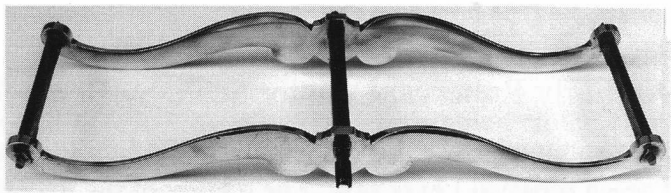


Fig. 4 ➢➢ The twin beam.

have no equivalents, except in two similar models (figs 12 and 13) by the same maker.

- The long pointer (170mm) is turned downward. Its upper end is a lyre made with two horns of plenty, capped by bird-of-prey heads. A flower with seven petals is nested just above the arrow head (fig 5). Beneath, the little angel's finger is used as a mark for equilibrium.

- The stay (figs 6 & 7) is amazingly fragile in relation with the quality of the rest of the mechanism[5]: each half-stay is very frail and held with wires (fig 8), whereas the legs, made of solid brass cylindrical rods, are rather thick (15mm diameter!) and the steel knifes at their lower end are carefully set in the brass through a dovetail adjustment.

- The box, made in walnut, stained the colour of wild cherry wood, is long and narrow (690 x 180mm), hardly wider than the beam (140mm). The box's bottom is closed with a thick screwed-on iron sheet.

- The brass plate just above the fulcrum (fig 3) is carefully engraved with the maker's name (BÉRANGER ET C^{ie} à Lyon) and fabrication date (1844). The maker's name appears also on the inner side of each beam, just under the fulcrum. The following marks can be seen on each pan:

The maker's trademark (fig 9), i.e. the crowned star, in relief, inside a hollow rectangle (in size 4.5 x 3.5mm). This design is quite different from the well-known crowned star one can usually find on later models of Béranger *balances-pendules* counter scales, made under the trademarks of Béranger & Cie, Catenot-Béranger & Cie, Usines de la Mulatière or Trayvou).

The royal crown mark (used as first verification stamp between 1830 and 1848) and two annual verification marks: G for 1846 and part of another undefined character (maybe F or H).

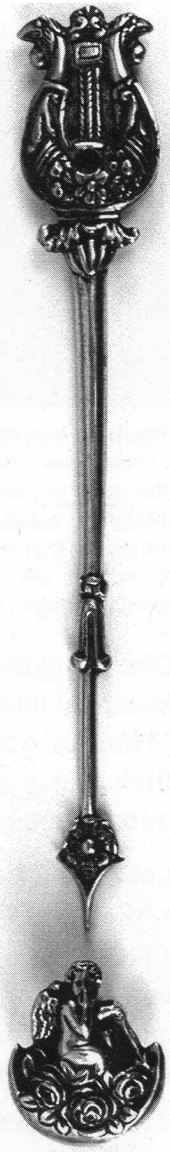
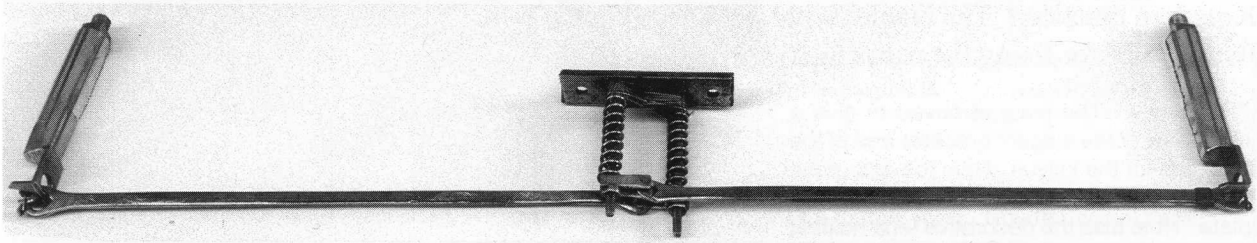


Fig. 5 ➢➢ Detail of pointer, showing the lyre, birds of prey, flower, and the angel sitting in flowers.

Fig. 6 ➢➢ Detail of stay across the bottom and legs that go up to the cross-pieces of the beam.



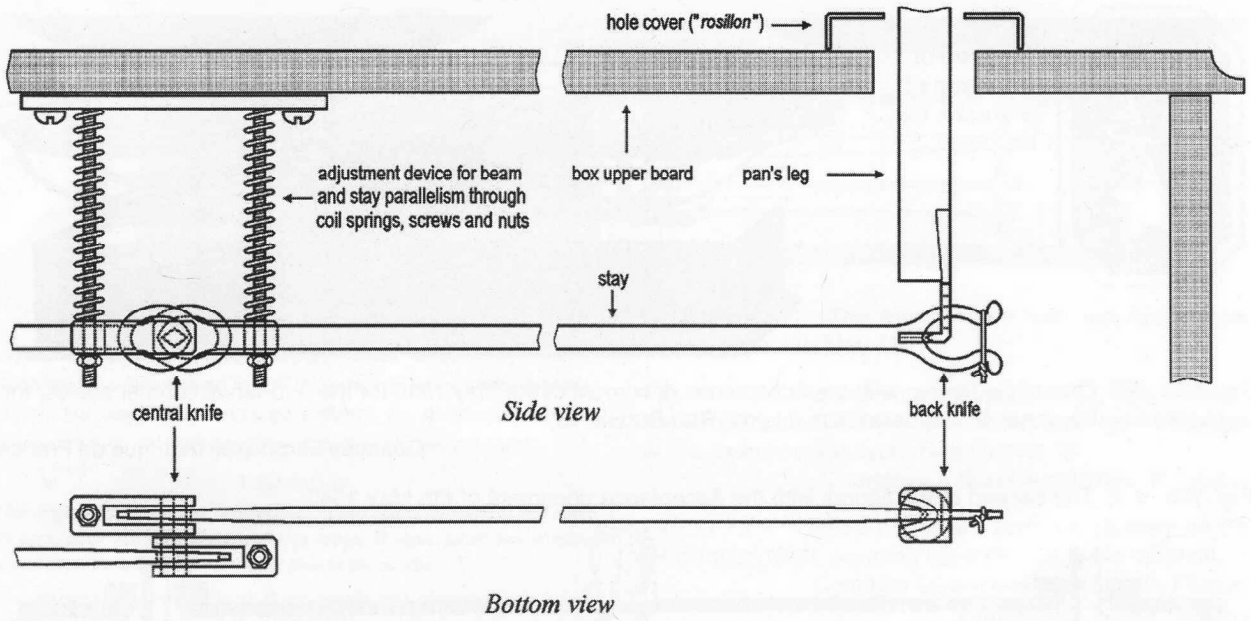


Fig. 7 ⋏⋏ Principle of stay and legs, drawn by the author.

I'll now try to locate this superb scale in the story of the early French roberval scales.

In France, the first acceptance (*admission*) of Roberval scales was announced by the Weights and Measures Administration for Joseph Béranger through a ministry decision (*arrêté ministériel*) on 6th May 1840, (fig. 10) followed by a circular delivered all around the French territory (*lettre circulaire aux Préfets*) on 5th December 1840,[6] (fig.11).

That acceptance was made both for several roberval models (at least 3) and for the first platform scale with a steelyard, invented by Joseph Béranger.[7]

If we consider the plate attached to the acceptance (fig 10), the 1842 advertisement plate (fig 12), the mysteriously-named [by Giraud] scale *La Lyonnaise* Patent no. 11653 (fig 13) and of course the present scale, we get nine different roberval counter scales made by Joseph Béranger between 1840 and 1844. That important number proves he really wanted to invest in the production of roberval scales. As a pioneer he had to do so, roberval scales being (together with platform scales) the up-to-date weighing machines at that time.

Two of these nine models have a base very similar to English roberval scales and some others anticipate the famous *balance-pendule*, using twin beams and even, for one of them (fig 10d), a beam hidden in the box and arrow-shaped pointers[8] too.

Among these 9 scales I paid

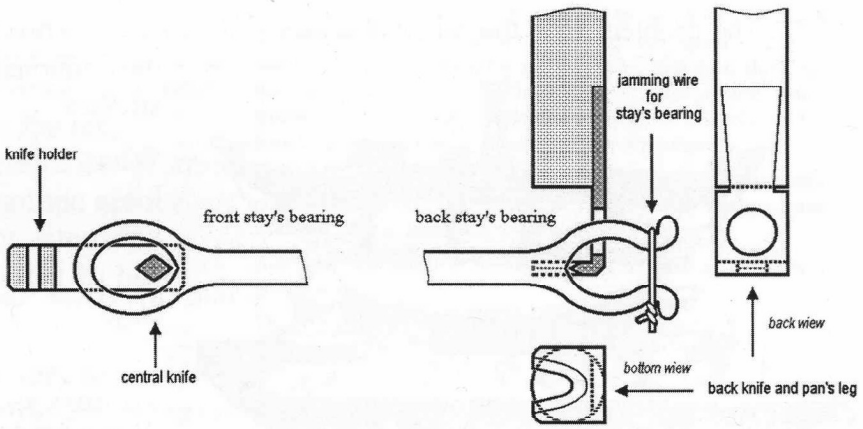


Fig. 8: ➢➢ Diagram: close-up of stay's bearings and knifes.

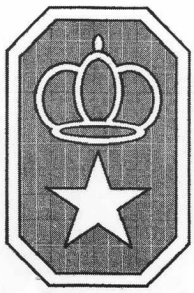


Fig. 9 ≺≺ Close-up of the crowned star mark (on the pans).

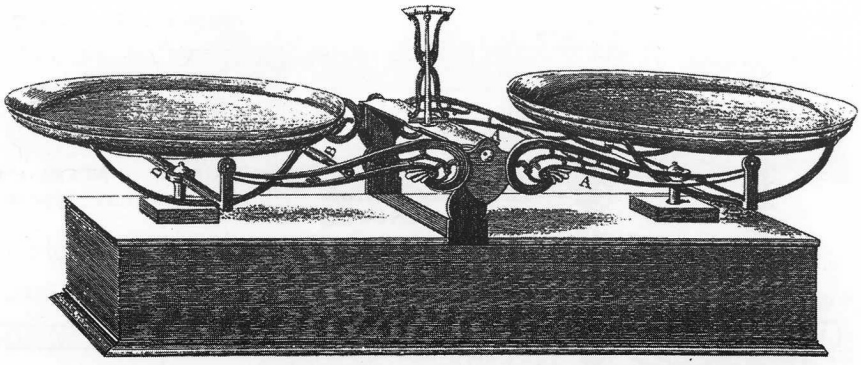
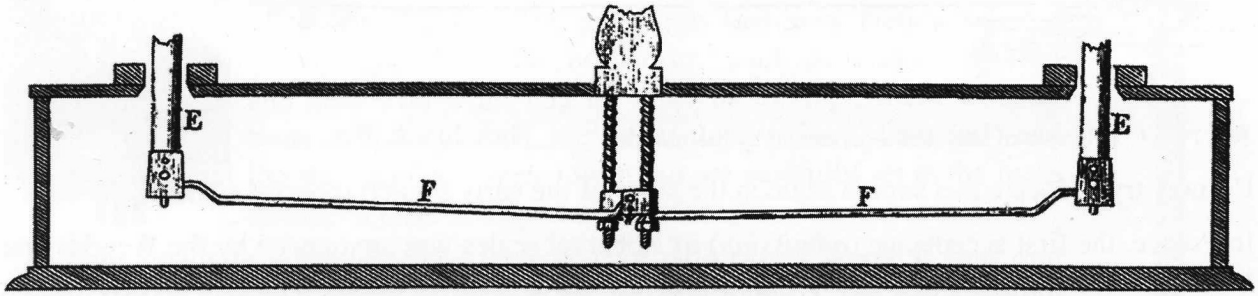


Fig. 1Oa ≻≻ One of the figures with the Acceptance document of 6th May 1840 for the 3 roberval counter scales, the application by Béranger & Cie, balanciers à Lyon, Rue Dubois 15,

Courtesy Le Société métrique de France

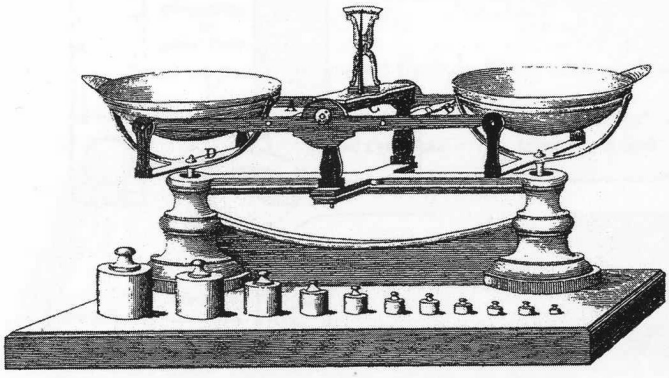
Fig. 10b ≻≻ The second of the figures with the Acceptance document of 6th May 1840



special attention to the four models which have a volute-shaped twin beam, in chronological order:
(a) The nice scale (with openwork twin beam) of 1840, shown in fig. 10a and also, with only a slight difference in the pointer's shape, in fig. 12 at the top, (upper model on the 1842 advertisement plate).
(b) The model shown on the right in the second row on the 1842 advertisement plate (fig. 12). I guess it is twin-beamed because the text mentions beams (*fleaux*), as for model (a).
(c) The present scale of 1844.
(d) The scale patented 12th August 1844, no. 11653[9] and named by Giraud *La Lyonnaise* (fig. 13).

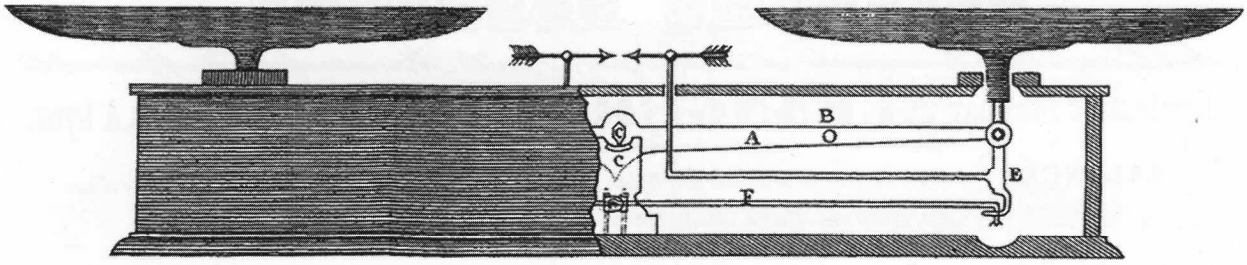
Considering the evolution from (a) to (d) both in the cradles and in the stay and legs linkage, gave me an idea about what Joseph Béranger was trying to do to improve his roberval scales. But first let's ask why, what and how?

Why? The problem with the roberval scales is the *linkage between the stay and the legs*, where the rotational effect creates undesirable side stresses.



What? To get a good contact neither too loose nor too tight, Béranger tried to create horizontal forces moving from the lower end of the legs towards the middle of the stay.

Fig. 10c ≺≺ The third of the figures with the Acceptance document of 6th May 1840



ATELIERS *Cours Trocadero aux Brotteaux* LYON

We name the Robervale balance, called after the inventor Roberval, an apparatus by means of which weights equally placed but appearing unequally placed in distance from the fulcrum point, notwithstanding appearances, are balanced.

Description

This apparatus fig 1 and 2 is composed of two levers **A**, *parallel and equal to each other fixed by the transverse levers* **B** *these latter two working together on the axis* **C** *which divides then in the middle.*

The horizontal transverse pieces **D** *are mobile, they play on the axes at the extremities of the levers and are guided by two vertical rods* **E**, *which are also parallel and equally stay always vertical in all positions and the levers which take by their connection to the other horizontal pieces* **F** *by acting below and parallel with the levers* **A**.

On the transverse pieces **D** *are placed the basins or plates of the balance destined for the use of weighing.*

Verification

Check the construction and the free movement of all the parts: load the balance with equal weights in the position corresponding with the centre of the parallelogram formed by the two levers **A**, *and the two transverse pieces* **D**, *then if the balance is maintained and the levers return to their horizontal position then they have equality of mass and in their distances from the points of support.*

The effect should be the same and the balance always be maintained if of the two equal weights one is placed further out than the other on the parallelogram although at this time the distance of the weights from the axis of the movement appears very different, this difference does not have any consequence and the effects are always as if the weights are suspended at the extremities of the levers; therefore they are equal and they should produce equilibrium when in any position.

The Balance should in addition provide the same sensibility as other weighing instruments that have equal arms, which is less than 1/2000 of the capacity. (Official Notices page 209)

In fig. 4 the mechanism is entirely hidden in the box, the pans only being exposed.

How? He acted gradually on two characteristics:
offsetting the pan's cradle from the leg,
changing the kind and the orientation of knife edges at the lower end of the legs and of bearings at the ends of the stay.

Let's now examine the four steps in that evolutionary process:
In the first model (a) the cradle appears to be still quite traditional, combining a cross and a ring (as

Fig. 10d ⩓⩓ The fourth figure with the Acceptance document of 6th May 1840

Fig. 1Oe ⩔⩔ Acceptance document of 6th May 1840 for the 3 roberval counter scales, the application by Béranger & Cie, balanciers à Lyon, Rue Dubois 15,
Courtesy Le Société métrique de France

Fig. 11 ⩛⩛ Official document from the Ministry on 5th December 1840, covering his steelyard & his roberval.
Courtesy Le Société métrique de France
Translations by R L Hitchins

MINISTRY OF AGRICULTURE AND COMMERCE

Division for Domestic Commerce, for Manufacture and Utilities

Bureau of Domestic Commerce, Weights and Measures

Acceptance for the verification system to be applied to the weighing instruments made by Mr. Béranger, balance-maker of Lyon.

Circular no. 35.

Paris, 5 December 1840.

Dear Sir, by a decision of 6th May last, my predecessor accepted for initial and periodic verification marks, two balances by Mr. Béranger, balance-maker of Lyon.

The first, shown in the top quarter of the plate, is constructed using the principle of the rocking balance (*balance bascule*); it combines this system with the system of the oscillating steelyard with a poise.

The second is a balance with two equal arms, following the roberval principle.

Before placing the stamp on instruments of this kind which may be presented to them, the verifiers should refer to the Ministerial Instructions concerning the general principles of good construction of similar instruments and decide whether these instruments are in conformance with this model, and whether all the parts of which it is composed are working freely and without friction; they should, in addition, be assured that the knife of the poise of the steelyard balance is in a tempered steel and that the divisions of this instrument correspond exactly to test weights, kilogramme by kilogramme; finally, they must check whether this instrument has the required sensibility that remain fixed at a thousandth of its capacity.* When considering the said roberval balance, it must be sensible to a two-thousandth part of the capacity.

An example of the present circular should be put up, with the drawings, and the descriptions that accompany them, by every verifier; I send you sufficient for this. Please acknowledge receipt.

Accept, sir (*Monsieur le Prèfet*), my assurance of my most exceptional good wishes,

The Secretary of State for agriculture and commerce,

Signed L Cunin-Gridaine

For transmission,

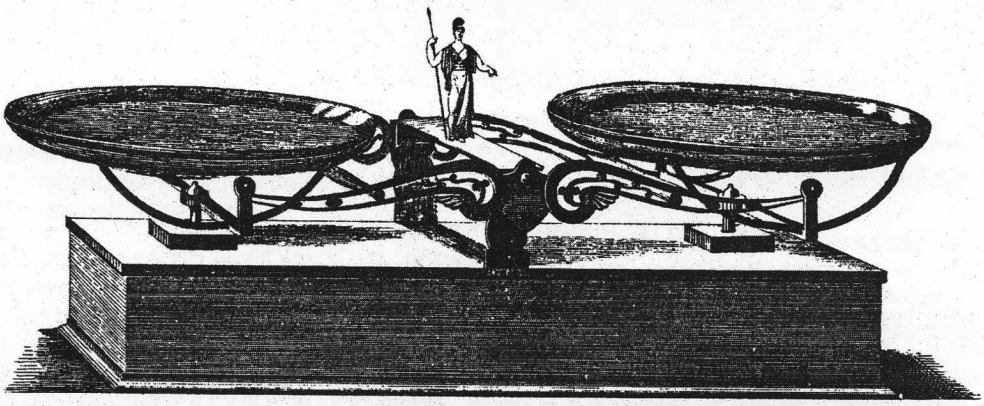
The Chief of the Division

BALANCES ROBERVAL,

dont l'usage dans le commerce est autorisé par Arrêté Ministériel du 6 Mai 1840.

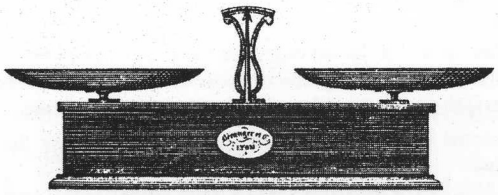
Confectionnées par BERANGER & Cie Balanciers-Mécaniciens, à Lyon.

BALANCES *modèle riche, à Bassins mobiles, et Fléaux en cuivre à jour, surmontées d'un Mercure ou d'une Minerve en bronze, Tablette en acajou.*



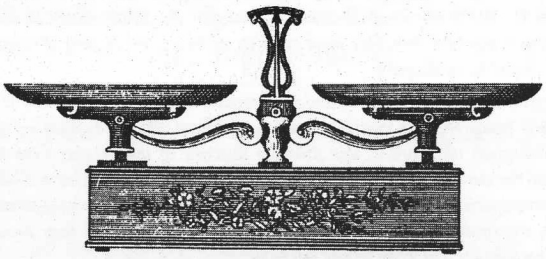
Grandeur des Bassins		*21*	*24*	*27*	*30*	*Centimètres.*
(Autres à Fléaux droits et à 1/4 de cercle.)	*Prix*	*200*	*220*	*240*	*260*	*F.*
	"	*150*	*170*	*190*	*210*	*F.*

BALANCES *à Bassins fixes, Tablette en noyer vernis, à l'usage de tout commerce.*



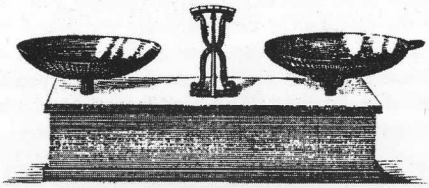
Grandeur des Bassins	*21*	*24*	*27*	*30*	*Centimètres*
Prix	*100*	*120*	*140*	*160*	*F.*

BALANCES *modèle riche, à Bassins mobiles, Fléaux pleins en fer ou cuivre, Tablette avec incrustation.*



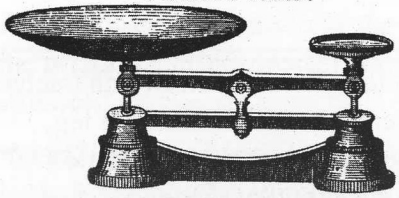
Grandeur des Bassins	*21*	*24*	*27*	*30*	*Centimètres*
Prix	*150*	*170*	*190*	*210*	*F*

BALANCES *pour le détail des tabacs et pastillages, avec un bassin mobile*



Grandeur des Bassins	*12*	*13*	*14*	*15*	*Centimetres*
Prix	*35*	*40*	*45*	*50*	*F.*

BALANCES *pour ménage et pour maison de Banque, 1 Bassin ovale.*



Portée	*5*	*10*	*15*	*K.°*
Prix	*40*	*50*	*60*	*F.*

Fig. 12 ⩓⩓ Advertisement by Béranger for Roberval counterscales in 1842. The magnificent version at the top was available with loose pans, and with either Mercury or Minerva as the decorative finial. The cheap second scale, with fixed pans, was for normal trade use. The fancy third version was available with iron or brass beams. The fourth version was for tobacco or sweets. The last version was for weighing money in a bank. *Le Système métrique*

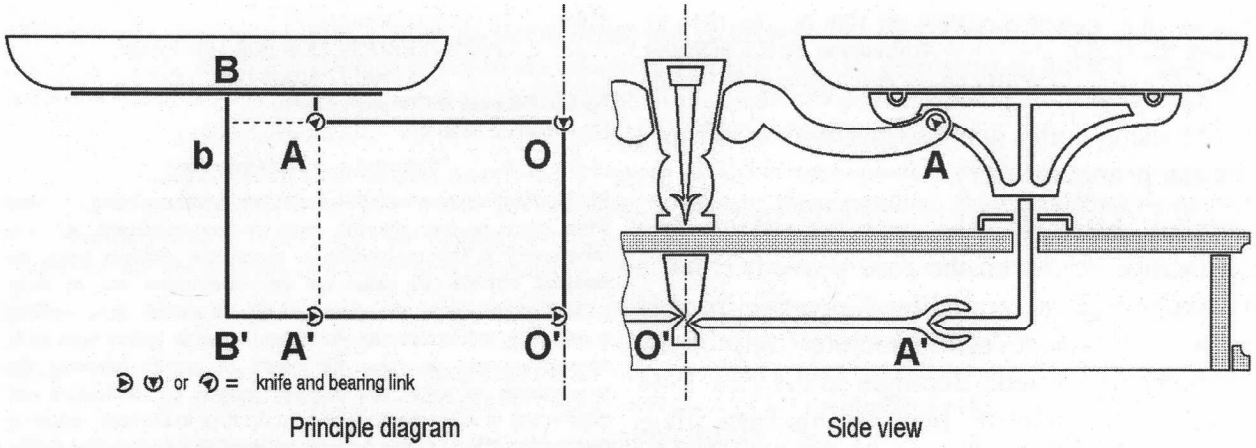


Fig. 13a ⋏⋏ Diagram: side view and principle of the scale patent no. 11653.

far as I can read the drawing). The side view shows two half-stays apparently working as an inverted beam, the knives pointing downwards (the stay's end looks like a horn-hole end) and being hooked to the stay.

In the second model (b) the cradle changes to two parallel rails into which the pans are plugged by four horizontal pegs. Note that the bearings for the beam's end knifes are still in the cradle's middle, directly above the legs. Unfortunately we have no picture to show how the stay works.

In the third model (c) the cradles are similar to model (b), except that both the beam's knives and the leg are offset from the cradle's middle. That infers a centripetal force on the leg's lower end and consequently on the stay. Thus the stay's bearing and the leg's knife are pushed together and don't need to be hooked together as in model (a) but just prevented from escaping by a simple wire (see fig 8).

In the fourth model (d) the cradle remains offset but the centripetal strength is increased by offsetting from the leg[9] the beam's knife (oriented at 45°) and its bearing in the cradle. Fig. 13. The stay is quite free, only held by pressure. Giraud mentions that Joseph Béranger had to give up that model because of the weakness of the stay and because of problems in operation (the stay was trying to escape from the leg's knife when the scale was empty).

In the end, all these devices proved to be inefficient. The best solution was different, either using two half-stays, as in Westphal's scale, or one stay as in Wimmerlin's scale (which is considered to be the first, in 1853, to get the final characteristics of roberval scales in France).

I think that Joseph Béranger knew that he was in a deadlock with roberval scales. I couldn't find any trace either of acceptance or of refusal for the present scale or for Patent no. 11653 by the Weights and Measures Administration and no more trace of further acceptance for any roberval scale made by Joseph Béranger.[10] Maybe that failure was one of the reasons which made him change his mind, trying to avoid horizontal forces in the static equilibrium. That finally led him to the *balance-pendule* (accepted on 27th May 1848 but patented earlier, on 9th June

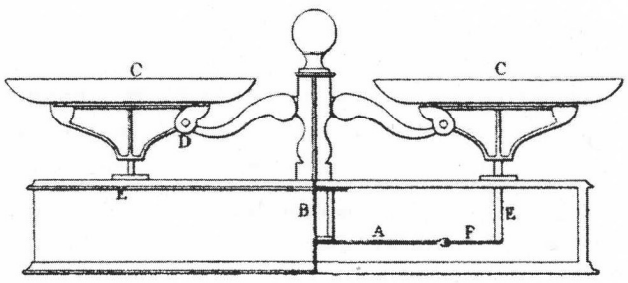


Fig. 13b ➢➢ Diagram: side view and principle the scale patent no. 11653.

Fig. 14 ➢➢ Patent document on 12th August 1844 for patent no. 11653. Translation by R L Hitchins Courtesy Le Société métrique de France

11653

PATENT PROTECTION FOR TEN YEARS
dated 12 August 1844

For Mr. Béranger & Company of Lyon,
For a roberval balance.

Description of the Mechanism

Pl. 33. The balances called Roberval are constructed in a thousand forms more or less graceful, more or less handsome, it being unnecessary in this explanation to specify the different types; the essential remarks to make on the construction are to show parallelograms, **a** in the plates which accompany this, working horizontally, and underneath the plates, a double system seen as **b**, serving to raise or lower the centre of gravity following the requirements to adjust the balance; because the difficulties one experiences in adjusting the pans from the front to the back, following the position of the weights, have disappeared on account of the facility to freely raise or lower the centre of gravity of the parallelograms.

It is important that each parallelogram can rise or lower in each leg independently and is precisely between the axes of the pans.

In this initial description it should be added that it is very important that the off-centre bearings of the pans work with the axes at the ends of the beams.

In other words, the centre of the basins or pans **c** of the balance must be outside the axes **d** of the upper arms, so that the vertical legs **e** communicate with the bottom parallelograms **a** by means of the return of the square **f**, not forming an obstacle, but maintaining continuous pressure.

This continuous pressure, communicated to the parallelogram, is received by the extremities, transmitted by sharp edges, forming bearings, so as to give all possible sensibility to the balance.

The vertical legs **e** can exist at a greater or smaller distance.

1845), using knifes and bearings with oval rings, but that is another story.

Coming back to the present scale, the verification marks on the pans prove it is not a prototype. It is probably a prestige model[11] especially made to commemorate[12] one of the prizes won by Joseph Béranger in the year 1844 (his five-years industry medal or his Paris silver medal), which could explain the palms around the date on the engraved plate (fig. 3).

This scale was probably used as a counter scale in a luxury business (but not in the silk trade as for that the square pan would be 2 or 4 edged).

Biography

Michel Heitzler started 20 years ago to collect old wood-working tools, firstly for their beautiful shapes and then because as an engineer in data processing he was eager to be reminded of manual work. As scales and weights are often sold next to tools by the same dealers in flea-markets and antique fairs, he was led to get more and more interested in weights and measures. He has been collecting weights, and especially scales for more than 15 years, paying especial attention to the graduations on pre-metric steelyards and to béranger counter scales of all kinds. He is an active member of the Société métrique de France. He is planning a special issue of *Le Système métrique* for the bicentenary of Béranger's birth. If members of ISASC wish to participate they are welcome to contribute.

Notes and References

1 Giraud, R, *Histoire du pesage en régions Lyonnaise,* Imprimerie des Beaux-Arts, Tixier & Fils, Lyon 1986, 368 pages. This book notably contains detailed information about Joseph Béranger and his heirs and successors.

2 Joseph Béranger is more famous for his platform scale with a steelyard (1840), his *balance-pendule* counter scale (1848) and his many weighbridges than for his first roberval counter scales. But my purpose is not to tell here the Béranger Company saga; for more information, read Crawforth-Hitchins' text Joseph Béranger, *EQM* p 1663-1664.

3 On the pan's cradles, the bearings are in steel rings, forced into the brass.

4 See J. Knight's article Indication of Instability, *Equilibrium* p 1646.

5 As I disassembled (for cleaning purpose) small Béranger *balances-pendules* counter scales, I often noted that the inner parts were made of rather poor materials (such as folded iron sheet, iron wire...) which is rather astounding, considering the high quality of the outside parts of these scales. But perhaps the maker did not intend to botch up the hidden parts but only to build them as light as possible.

In fact, in the present model, there is an obvious contrast between the stays and the upper parts of the scale (cradles, beam and legs): the front bearings of each half-stay (see fig. 8) were so thin that they broke when I was cleaning the mechanism and I had to replace them by a wire, fortunately without any harm to the equilibrium of the scale.

6 This date (and other dates about acceptance by the French Weights and Measures Administration) comes from the summary published by Aimé Pommier in *Le Système métrique* (no 94/3 issue, pages 871 to 881).

Joseph Béranger was undoubtedly the first in France to get an acceptance for a roberval scale but that does not answer two questions. Who invented the roberval scale? I think that Giraud's assertions deserve some criticism. It is pretty risky to write as he does, that the French mathematician Gilles Personne de Roberval invented the roberval scale in

1669 and took out a patent for it in 1670. In fact Roberval just made an experiment in physics, which was known as *Roberval's Static Enigma,* and which remained unexplained until Louis Poinsot's demonstration in 1804. There is no trace of a patent or even of any document proving that Roberval thought of a practical use for his idea, although 18th century encyclopaedias placed drawings of his *Static Enigma* with their drawings of scales.

Who made the first roberval scale? In his book (p. 103), Giraud suggests (without any more information) that it could have been done in 1803 by a scalemaker from Strasbourg, named Merlin. Crawforth-Hitchins confirms that Charles Merlin of Strasbourg (half brother of John Joseph Merlin of London) is known for having made platform scales but she has no trace of a roberval scale made by him. And in France the acceptance acts started only in 1818.

Giraud also mentions (p 37) a request for acceptance in 1840 by another scalemaker also working in Strasbourg. Following that track, I only found a roberval scale accepted for the Fabrique Strasbourgeoise de Constructions Mécaniques (known as Rollé & Schwilgué's successor) on 6th January 1842 (i. e. more one year later than Joseph Béranger's. Nevertheless that acceptance can be classified as the second one in France, chronologically).

I don't forget the most widespread opinion that the making of roberval scales started in UK, as in France these scales had been known as *balances anglaises* for a long time. I refer of course to Michael Crawforth's study of Roberval, published 20 years ago in EQM (p. 127 to 134). His final hypothesis was that the first roberval scale was made at the beginning of the l9th century by an Englishman named Medhurst. This scalemaker also invented, between the years 1799 and 1817, various machines and mechanical devices without any connection to scales. However, no patent could be found under the name of Medhurst for a roberval scale. I don't know if further studies have provided arguments regarding that conclusion. Has anyone information about it?

7 Pommier, A, private communication. That is why the plate attached to the acceptance of roberval scales is called "Pl. 2" (see fig 10). The plate no. l is about that platform scale.

8 In France, using two opposite pointers is the most widespread method to indicate equilibrium in the variousbéranger *balances-pendules* counter scales but it is very rare in roberval scales. One can find such pointers on recent roberval scales from middle Europe (Poland, Czechoslovakia...) that have an openwork cast-iron base and so can easily be confused at first sight with phanzeder models, common in these countries.

9 That scale is shown in Brauer's book *The Construction of the Balance* (page 238) and in Giraud's book (page 105) too. Giraud calls it *La Lyonnaise* which can mislead people because it is too similar to the name *Balance Lyonnaise*, given by Béranger to his famous *balance pendule* scale. So I call it *Patent no. 11653 scale.*

The two diagrams in the latter book were unfortunately too small and not very legible (probably extracted from an old document in poor state), so a new diagram was drawn (before Aimé Pommier sent me the patent). On that diagram (fig. 12), one can note that the parallelogram **O A A' O'** doesn't include the pan's leg (in a common roberval, the knife on beam's end should meet the leg at **b**).

10 The existence of verification marks on the pans proves then that the present scale was accepted and it can only be by the act of 1840. But I wonder whether it could be the same for the Patent no. 11653 scale because it was somewhat different from the models shown on the plate (fig. 10) attached to that act. My opinion is that, according to the technical problems he encountered, Béranger perhaps didn't want to risk his reputation by a refusal of an acceptance.

One should note that the French scalemakers were not very eager to ask for acceptance of new roberval scales. The third acceptance was only issued on 22nd February 1853 (to Wimmerlin), i. e. more than 11 years after the second acceptance and more than 12 after Béranger's. I could only find 15 roberval scales accepted among about a total of 150 scales accepted during the whole 19th century

1840	Béranger			
1842	Fabrique Strasbourgeoise de Constructions Mécaniques			
1853	Davignon	Wimmerlin		
1856	Baillet	Castinel & Bonnet	Fines	Vassel
1857	Godet	Wimmerlin		
1860	Boué			
1864	Calais & Chairgrasse			
1885	Testut			
1895	Hoffman	Roche		

Maybe the list should include fewer than 15, as unfortunately I don't know anything about the plates attached to the acceptances and I may have been mistaken by some which are claimed as roberval scales but may be very different models, as for example the two acceptances for Falcot Frère on 25th June 1858 and 10th May 1863).

The main acceptances for roberval scales occured between the years 1853 and 1860, when many scalemakers had to fight against the béranger *balances-pendules* counter scales, still protected by patent then.

11 One can see on the plate in fig. 11 that the models (a) and (b) are so advertised, named as *modèle riche*. A plainer version is offered for model (b) at a lower price, with a straight beam.

12 It seems that Joseph Béranger was fond of making special scale models to commemorate prizes he won. For example, about a decade later, he made a rare *balance-pendule simplifiée* scale as a luxury model. Its base represents a cloth over a table, made in brass or in bronze, accurately and nicely pleated and fringed (see Showcase EQM, page 784). On the plate attached to the acceptance for the *balance-pendule simplifiée* on 28th September 1854, that scale is labelled as *Honor medal model* (I think that his *Légion d'Honneur* in 1853 was so labelled).

Contemporary Comment, 1922

Thinking about the bent leg **f** invented by Béranger, this comment is interesting. It is taken from G A Owen's *A Treatise on Weighing Machines*. It suggests that Owen was not familiar with Béranger's solution of 1840 (which had, as explained by Heitzler, been out of production since about 1848 because of its tendency to come apart).

Leg and Stay Mechanism, -...A fundamental rule for good practice in the construction of weighing instruments is stated [in Chapter IV] - the knife-edges must be in those parts in which it is most essential to maintain the accuracy of the distance. British manufacturers, probably without exception, break this rule in their construction of counter machines. Just why they do this is difficult to say, particularly as the observance of the rule does not present great difficulty. As will be seen in Fig. [1], which show the orthodox connection of leg and stay in counter machines in front and side elevation, plan and perspective, the ends of the stay in counter machines are formed into knife-edges, which bear against a flat plate secured to the leg. But, as we have noted, the most important consideration, so far as the parallel motion of the beam and stay is concerned, is that the leg should be of correct length – that is, equal in length to the distance between the fulcrum of the beam and the fulcrum of the stay. Consequently, the leg should carry the knife-edge, and the stay the bearing. The non-observance of this rule is the cause of much inaccuracy in counter machines.

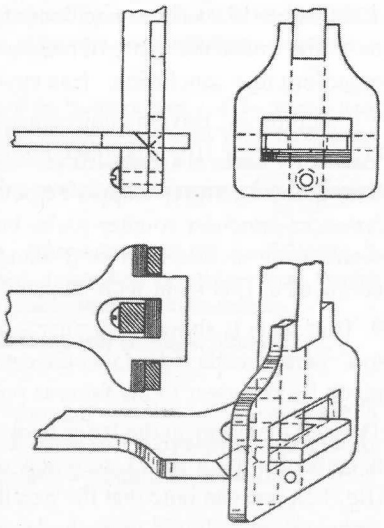
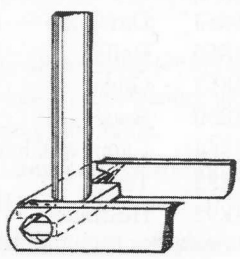


Fig. 1

A construction which is in accordance with the theoretical rule is shown in fig. [2]. It is found on some American machines, and although a somewhat crude execution, it does at least obviate variation in the effective length of the leg.

Fig. 2 ≺≺



From the above explanation of the principle of the roberval balance, it will be seen that certain thrusts and tensions sometimes of considerable magnitude, are introduced along the beam and stay when the weights are placed in certain positions on the scale-pans. These thrusts and tensions tend to grind the knife-edges on their bearings, a condition which is not conducive to accuracy nor favourable to the long life of the machine. In order to avoid the defect, several constructions have been devised, but the only variation in use in this country [UK] is the béranger balance [the *balance-pendule* of 1845].

Early Recording Milk Scale

BY U SCHMIDT

Certainly many of you have either seen or own one of the typical dairy scales once used at every farm to weigh the amount of milk from individual cows. Let me give you a little bit of the historical background which led, about 100 years ago, to the development of the depicted *Automatic Registering Milk Scale*.

The industrial development, starting in the middle of the last century, initiated a rapid growth of cities with a big demand for food. This obviously included milk, butter and other dairy products. What a challenge for the farmer; he had to increase, at a fast pace, his output and quality of milk. He was forced to breed, feed, and even select cows for his herd according to their productivity. But, there was the unanswered question of how to measure the success of his choices. He wanted lots of milk with high butterfat content.

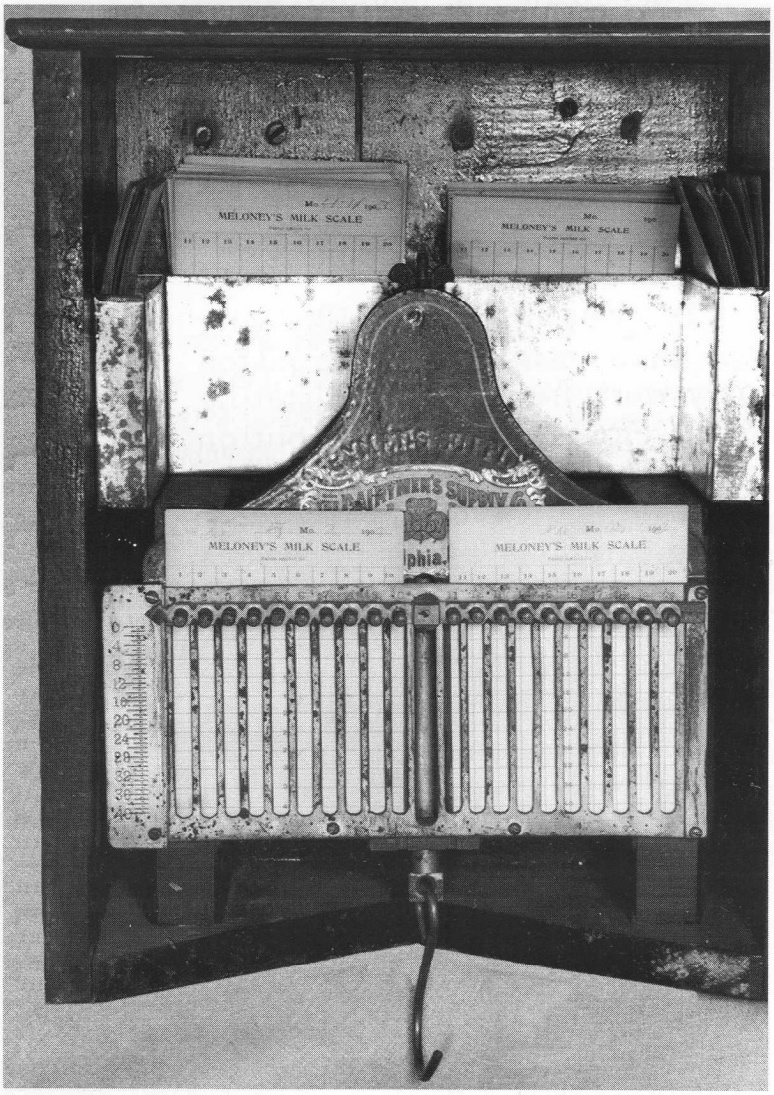


Fig. 1. ⮝⮝ Open Sesame! The mounted scale is hanging in its protective box. At the top are the screws to attach the box to the wall of the milking shed. Behind and above the scale are four boxes of cards. Two cards were inserted at each milking. In the middle is the spring balance, tared to take a bucket. Each side of the spring balance a card is inserted, ready to be punctured manually by the point behind the knobs. The knobs are all on a bar that descends, pulled down by the weight of the milk given by one cow. On the left of the cards is the graduated chart, showing the weight of the milk.

Fig. 2. ➢➢ The label on the inside of the door of the box.

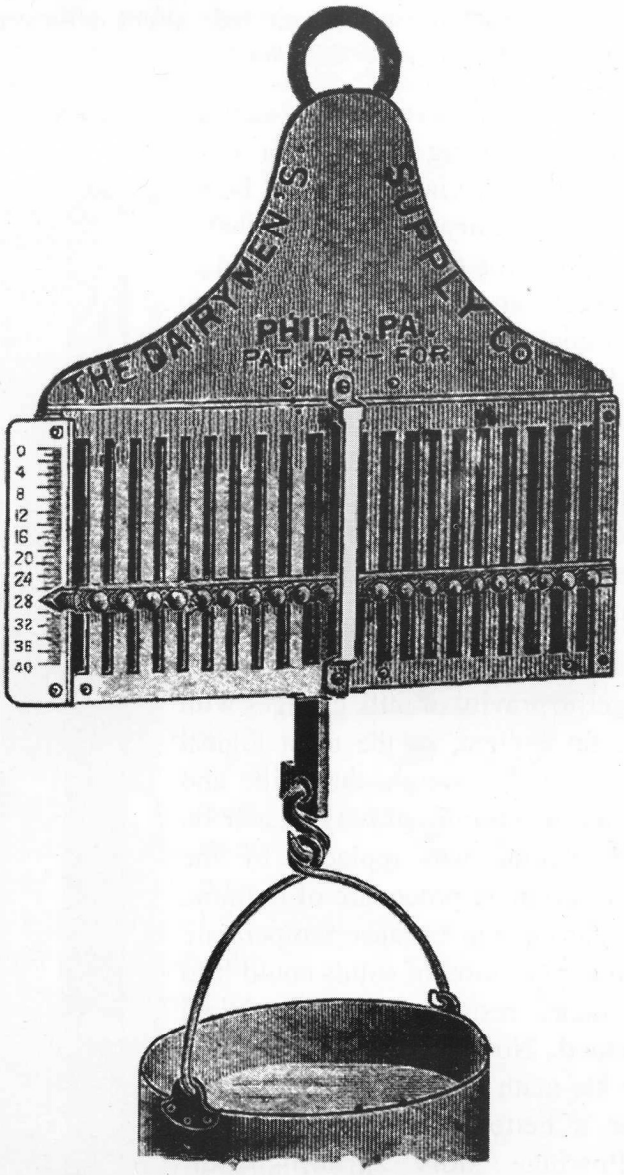
It was detected early on, that the specific gravity of milk changes with the fat content, so the most logical step was to weigh the milk and define its specific gravity. Later on this method was replaced by the more accurate procedure of defining the fat content because temperature and composition of solids could lead to faulty results with the original method. Now the farmer was able to do his math and define what's best. For a better explanation see the following story from Adolf Schoeneman out of his book *Milk Testing*, second edition, published in 1895.

Farmer James Dietrich is the owner of 2 cows; his favorite is Bess, a fine large cow with a daily yield of 32 pounds of milk. "Daisy," he says, "will be sold; she gives only 22 pounds of milk and eats just as much food." So, one fine day he went

INSTRUCTIONS FOR WORKING THE

MELONEY

Automatic Registering Milk Scales



Securely attach the scale box to a partition or post, being careful to have it level in each direction, that the plunger may work freely.

The scale is mounted on blocks, that the bucket may hang clear of partition or any obstruction. At the top of the cylinder will be found a thumb screw to adjust the scale, that indicator may register 0 when empty pail is hung on.

In weighing the milk hang the pail centrally that the piston may work freely. In registering the weight push on the button corresponding with the cow whose milk is being recorded. being careful to press in line with the pin. Pressure at an angle may cause a record slightly more or less than the actual weight. In putting the recording sheets in position see that they go down in the pocket squarely, and that the 0 line on scale and record sheet agree.

Keep the piston oiled and free from rust. Screws are furnished for fastening the scale box in position. Keep the door closed when the scale is not in use.

Additional scale cards or record sheets can be sent by mail at the following prices:

Per hundred set . . . $0.50 Per thousand set . . . 4.90

The cost of mailing, in addition to the above prices, is twelve cents per hundred set.

THE DAIRYMEN'S SUPPLY CO. MANUFACTURERS AND FURNISHERS.

Apparatus and Supplies for Creamery and Dairy

1937 MARKET STREET, PHILADELPHIA, PA.

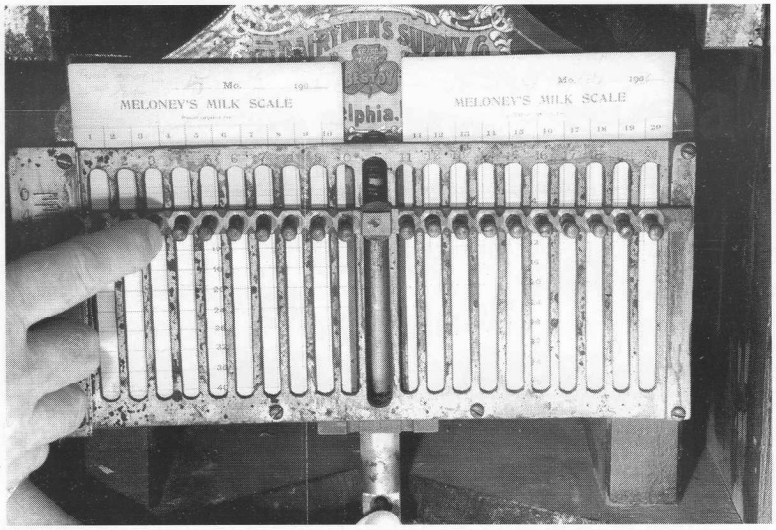


Fig. 3 ⋏⋏ The scale with recording sheets in position. The milk has pulled the bar down, stopping at 8-lbs. The farmer is about to record the output by pressing the knob belonging to that cow.

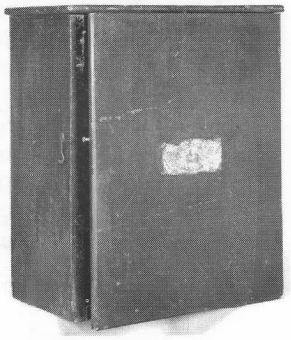
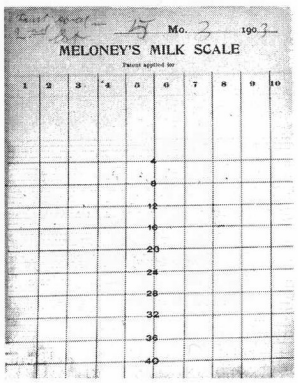


Fig. 4 ⋏⋏ The box, shown because of its extreme rarity. The colourful decal is shown in close-up in fig. 9.

Fig. 5 ⋎⋎ The scale card, with room to record the milk production of 10 cows. Additional cards could be ordered by mail at the following prices: $0.50 per hundred set and $4.90 per thousand set, plus postage charges of twelve cents per hundred set.

down to the cheese-maker, who tested the butterfat content for Bess 2.8% and for Daisy 4.6 %; and calculated that Bess produced only 0.896 pounds of butter fat, Daisy on the other hand produced 1.012 pounds, which is almost 13% more. James was astonished at those results and said, "I came near to selling my best cow for beef! I am glad you helped me."

With this, the scale proved once more its importance in and for our society. You can imagine that all the dairy farmers wanted scales, and with growing herds, more efficient ones. And that's how the Meloney Automatic Registering Milk Scales came into the picture. What progress! You could record the daily amount of milk for 20 cows on 2 little cards by just punching holes at milking time, and do the math in the evening with clean hands in your warm living room. I think that's about what the advertisement said for this certainly expensive scale.



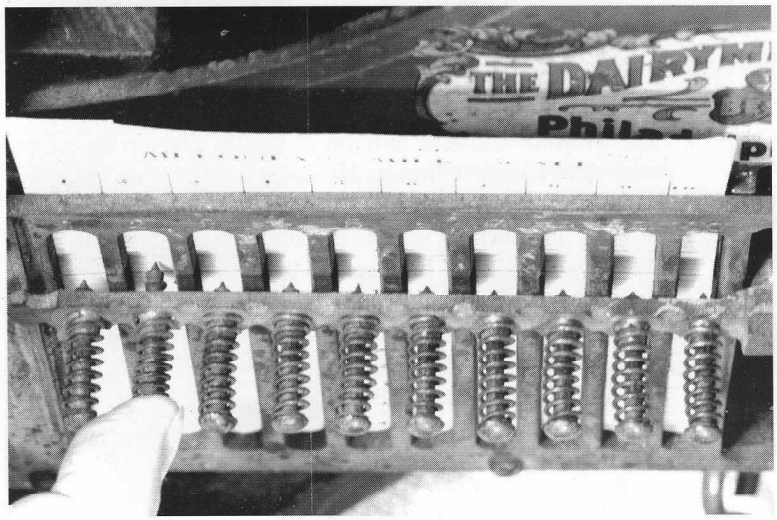


Fig. 6. ≺≺ Push the button. When the bucket of milk given by Cow # 2 is put on the spring balance, the bar with its knobs descends. The farmer pushes the knob in column 2, perforating the card and thus recording how much milk was given by Cow # 2 at that one milking. Because the knob has a spring wrapped round it, it reverts to the neutral position as soon as the farmer stops pushing.

Fig. 7 ➢➢ The decal (transfer) on the top of the scale and also on the front of the box, applied over the impressed name DAIRYMAN'S SUPPLY. The scale top is painted terracotta with a gold line, and the decal is yellow, with a green clover-leaf in the centre, red writing and the address in black. The scrolls are golden with green backgrounds, all very decorative and eye-catching.

For installation, usage and care, I don't want to deprive you of the joy of reading the original verbiage from the label, shown in Fig. 2. It is self-explanatory.

You can understand the excitement of the author to be able to see (in a private collection) and touch such a unique scale, totally intact, with even the original Cards including the punch marks. The handwritten date puts them back to 1903. What a find! His eyes un-focus writing this; he dreams to own it; he envisions a poster "Wanted Dead or Alive."

For the "headhunters" some data: Wood Case Color dark brown. Size; width 14"; depth 8.5"; height 17.5". Weight: 21-lbs. Scales Capacity 40-lbs.

I'm certain that two of our members will read the above with special interest. They own this scale, but have no knowledge of its age, function, the design of the scale cards, nor of the existence of this handsome case. By the way, I just ran across an advertisement from DAIRYMENS SUPPLY CO for another Meloney device, "The Meloney Milk Cooler" in *Hoard's Dairyman*, dated May 8, 1908. This product was designed to keep the milk cool in order to prevent it from spoiling or souring, in many states a legal requirement. The ad gives me hope that a future search in *Hoards Dairyman* brings forth an advertisement for the Meloney scale. Please feel free to contact the author with more information or questions about this or any other scale used for dairy products.

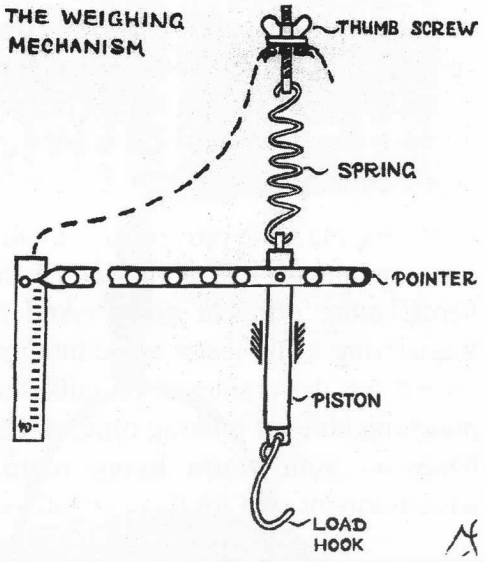


Fig. 8. ⩙⩙ The weighing mechanism.

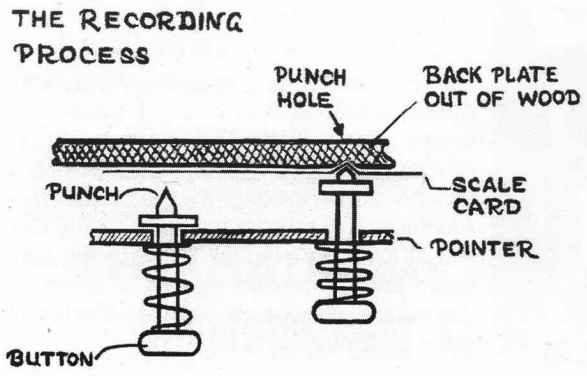


Fig. 9 ⩤⩤ The recording process.

Biography

Utz Schmidt's article falls on the 25th anniversary of his starting as a scale collector. He contacted the Crawforths and that turned him into "Scale-crazy Utz". He was one of the original members of ISASC and proud to organise and Chair the very successful Convention in Sindelfingen, Germany, with 42 members involved. His collection grew rapidly; when he moved to Detroit in 1985, scales filled a major part of his container. The bigger items remained in the Soehnle collection in Germany. Being an engineer, he was mainly interested in mechanical systems, but Dairy scales now loom large. More articles in this series are planned.

European Coin-ops

BY D F CRAWFORTH-HITCHINS

Part 2. 1902 onwards

In Part 1 we looked at the sober European scales that were more likely to attract customers because they looked so reliable and dependable than to attract customers because they were fun. Surprisingly even though the shop-keepers received money from customers for the use of their machines, they did not attract the attention of Board of Trade inspectors. After 1900 makers continued in the same sober vein. A squat French cast-iron scale was positioned on the promenade where tourists could casually test their weight, although the bulk of the clothes and the hat must have been a large part of the total!! Fig. 1.

Fig. 1. ➢➢ This French scale was photographed in 1903, so was probably made a while earlier. One wonders how much her weight varied according to which hat she wore!

Postcard

In England Henry Pooley & Sons Ltd showed a person scale in their 1902 catalogue that harks back to Everitt's design, being a boring box, quite unlike the lively cast-iron scales for which they were famed. Fig. 2. The box may have been made intentionally simple because the *Case may be lettered and decorated to suit requirements of purchaser*. Pooley's demonstrate the point by doing a bit of

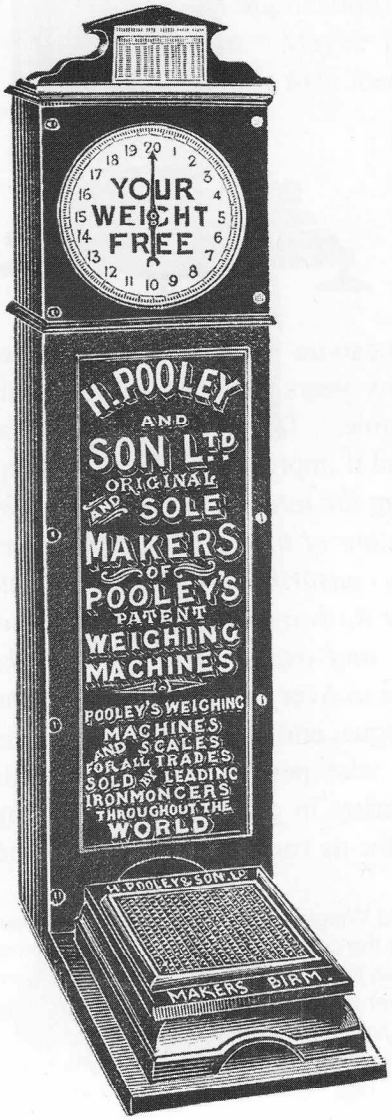


Fig 2 ➢➢ Henry Pooley & Sons Ltd 1902 free-weight scale in handsome polished hardwood case, capacity of dial 20 stone. Pooley's specialised in spring balances so presumably this was a spring balance.

Fig. 3. ➢➢ W & T Avery Ltd 1906-1916 catalogues, Automatic Penny in the Slot Personal Weighing Machine, capacity 20 stone, Prices on application.....[in 1916] *Since the State introduced Personal Weighing in Schools and proved the necessity of weighing oneself periodically as a safeguard to health, there has sprung up an enormous demand for Public Weighing Machines, and very large profits are being made from them. Specially recommended for the entrance Hall of Kinema Theatres, Music Halls, Exhibitions, Hotels and all places of public resort.*

Fig. 4. ≺≺ W & T Avery Ltd. machine exported to Spain and still in use. Capacity 120 kilos. It is placed outside a restaurant, in full sunshine, not a feature that would figure in an English manufacturer's considerations!

Photo courtesy Avery Historical Museum

Fig. 5. ➢➢ G Hartner c.1913 New Automatic Person Scale, almost 7 feet (206cm) high, available in painted wood or with a silver finish. Over twice the price of their really elaborate chair person scale.

advertising for themselves; *Pooley's Weighing Machines and Scales for all trades Sold by Leading Ironmongers throughout the World* being on the lower part of the box. The design is interesting because it was so cheap (only £9..10s..0d) and YOUR WEIGHT FREE. The purchaser bought it only to attract customers to his site and his advertising, in direct competition with the purchasers of coin-op scales.

Averys (fig. 3) were always very conscious of what their main competitors, Salters and Pooleys, were making. Salters had their handsome cast-iron coin-ops (see EQM p 2451) in production for many years before Avery came up with this equally magnificent machine. The faux marbling was japanned on, the lettering was gilt, and it improved on Salters second design in having *a Glass Dial showing the internal Mechanism. The Workmanship, Materials, and Finish are of the very best, and there are no springs to get out of order, thus ensuring correct Weighments being obtained. Specially suitable for Railway Stations, Piers, Hotel Grounds, Pleasure Gardens, Parks and exposed positions. The whole of the Takings are Profit.* It was in Avery's 1906 catalogue and still being offered in their 1916 catalogue, and one example is still in use in Brega in Spain, adapted to take pesetas. It has lost its marbling, but is said to draw the tourists in great numbers. Being used for perhaps 90 years says a lot for its rugged construction, and

Fig. 6. ≺≺ W & T Avery Ltd 1916 Coin-freed Weighing Machine with wood case, for indoor use only. The shell decorations on the corners of the platform and base are the only notable decorative features on this sober machine, so customers were not attracted from any distance away. However the customer did get an interesting experience when the coin was inserted because he could watch the top part of the mechanism turning and rocking. A less-decorative variation of this scale is in the Avery Historical Museum, looking very interesting mechanically, but unfortunately at present the mechanism is jammed.

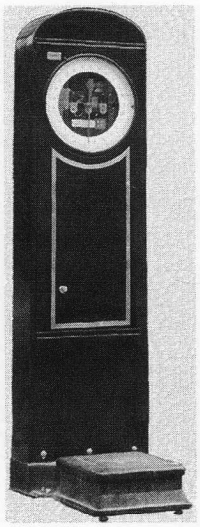


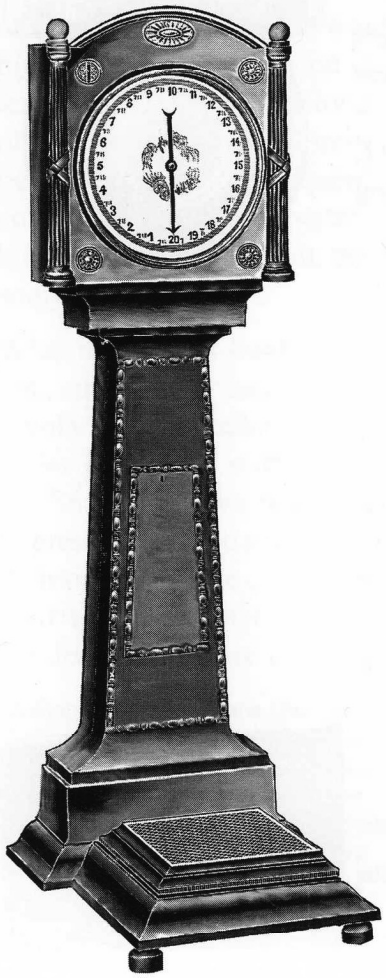
Fig. 7. ≺≺ SAFAA coin-op scale seen in a Parisian park.
Photo courtesy B & J Berning

Fig. 8. ≻≻ Day & Millward 1924 penny-in-slot Automatic Weighing Machine, this version costing £60 with brass rails.

for the Spanish repairmen's ingenuity!

Hartner in Ebingen, Germany, offered 27 different person scales, mostly steelyards, in their c.1913 catalogue, but only one coin-op with a height rule up the side. Fig. 5.

Avery continued to develop their coin-freed machines even though Britain was involved in a World War in 1916. Amazingly, they looked back to the Everitt-type wooden box with a pendulum mechanism like Everitt's! It must have been cheaper to produce (prices were discreetly given on application) but it was only suitable for indoor use. Maybe the wooden panels were easier to obtain than metal during the war.



The French scale company SAFAA (Société Anonyme Franchise Des Appareils Automatiques) made a similar boxy scale, which was, surprisingly, photographed in use recently in a Parisian public gardens. Although the shape is reminiscent of wooden boxes, it is made of sheet steel painted dark green, with the mechanism brightly painted. The date of the scale is unknown.

Day & Millward offered a superb, old-fashioned automatic weighing machine in 1924 *Strong and Handsome Weighing Machine....neatly Japanned and Ornamented* for £54, a huge sum in those days, being more than the annual income of a craftsman.

Carnegie & Leyton offered one of the last dignified coin-ops in their catalogue of 1928. It was probably more eye-catching than earlier ones, being available in blue and gold, white and gold, or maroon and gold. Even with hand-rails it cost only £42..10s..0d, (compared with Day & Millward's £60), a reflection of the less-complicated casting necessary, perhaps, yet their small person-weighing platform steelyard machine was a tenth of the cost of a penny-in-the-slot machine. Shop-keepers must have hesitated to invest such large sums in a coin-op weighing machine, even though the makers emphasised the profits to be made (eventually!)

Fig. 9. ≺≺ Carnegie & Leyton (C & L) offered this elegant machine in their 1928 catalogue, but it marked the end of an era for dignified machines.

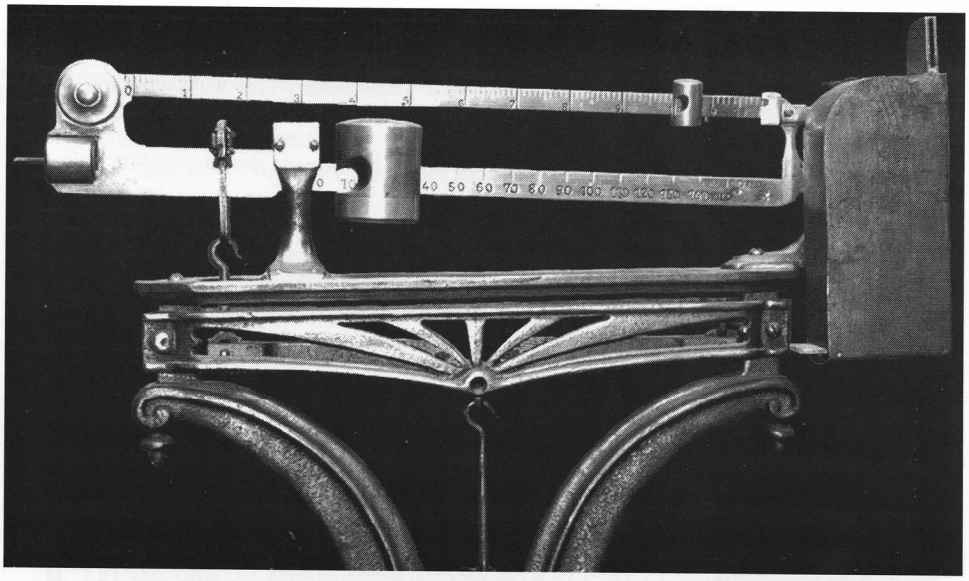
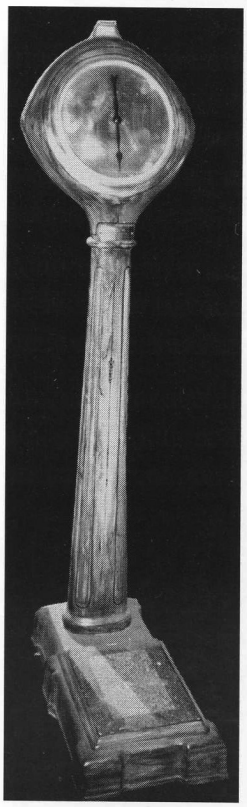


Fig. 10. ➢➢ Anonymous Italian coin-operated steelyard, date unknown, capacity 150 kilos.
Courtesy Brian Read

An Italian scale company even took a steelyard platform scale and adapted it to coin-operation. It can only be identified as Italian by the large brass boss on the top left of the beam – a very distinctive Italian feature. Although a steelyard like the Fey Public Weigher (EQM, p 2461) it lacks the integrated design of a Fey.

After 1928, coin-ops were more basic lollipop shapes; manufacturers started to encourage their designers into thinking up imaginative designs for domestic personal weighing machines for private use in the bathroom. Gem made a coin-op, fig. 11, thought to be from the 1930s, of very uninspiring design.



BAC (British Automatic Company) made, sold or leased out numerous vending machines, particularly those installed in railway stations from the 1920s to the 1960s, but it seems likely that one of the major manufacturers made the scales for BAC under license. The big-heads had sparkling double-pendulum mechanisms visible behind the glass dials, and that type can still be used in shopping centres in Britain. The author weighed herself this spring on one such machine, with a great feeling of maintaining a tradition going back over a hundred years.

Fig. 11 ➢➢ The Gem, a taste of the boring machines available through the 1930s until the 1960s in Britain.
Photo courtesy R Meade

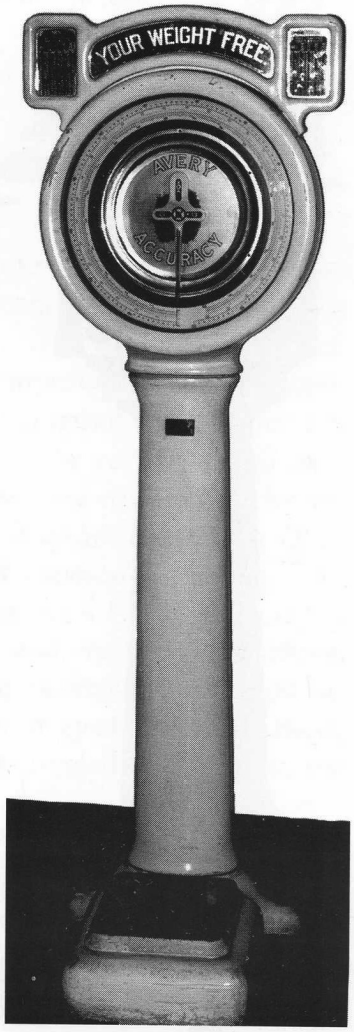


Fig. 12 ➢➢ Avery coin-op adapted for free use, date unknown, but cream stove-enameled so probably 1950s.
Avery Historical Museum. Photo courtesy R Holtman

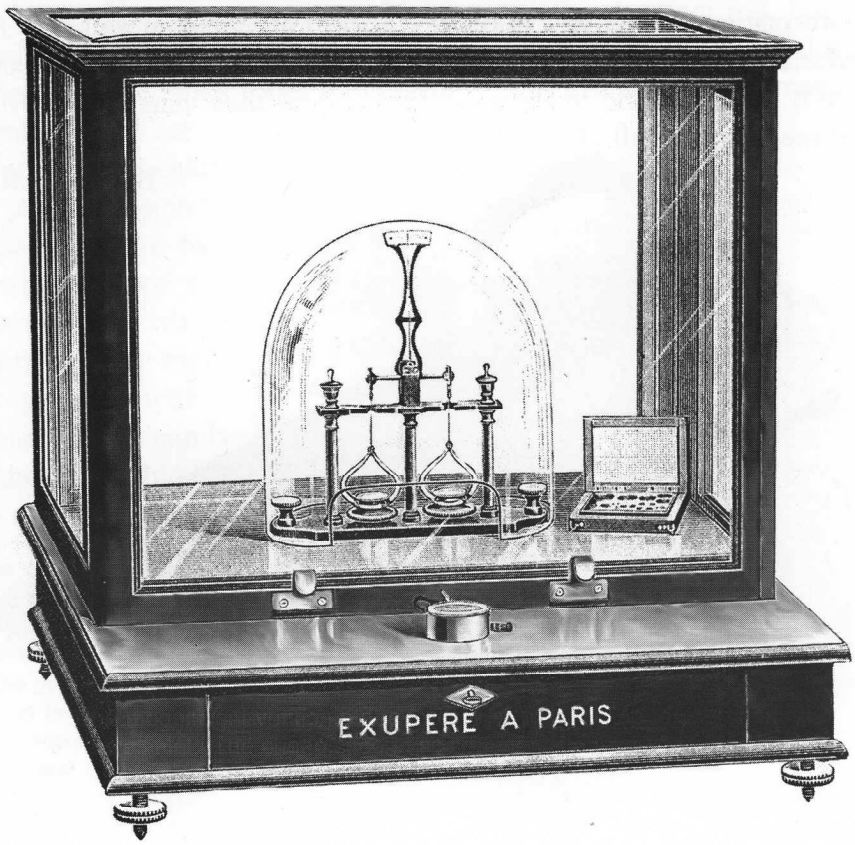
Review

The Assay Balance, Its Evolution and the Histories of the Companies That Made Them, by John and Geraldine Shannon. Self-published in 1999, 8.75 x 11.25", 241 pages, with 7 color photographs, numerous black and white illustrations, and five informative appendices. ISBN 0-9676841-1-0. Price soft cover $57.50, hard cover $77.50, postpaid. International shipping charges by arrangement. Available from 7319 W. Cedar Circle, Denver, CO 80226, USA, Email rovers@aol.com

The publication of the Shannons' long-awaited book triggered a flashback to 1994 when I joined ISASC. The April President's Newsletter indicated that the publication of a book on assay balances was imminent. Six years later, after writing a book with high interest but a limited market, the authors have published a work of which they can be very proud, and which will not be superseded except by an enlarged edition.

While the book is about the historical evolution of the assay balance, its scope is much broader. As the authors say in their preface, "Early investigation . . . led us back to the beginnings of civilization, through the Egyptian era into Greek and Hellenistic times, through the Middle Ages, the Renaissance, and into the Modern Age. We found that through the centuries merchants, goldsmiths, alchemists, assayers, engineers, scientists and balance manufacturers all were to contribute to the evolution of the assay balance." If you have ever wondered what a touchstone is, or how an assay balance would relate to a blowpipe set, this is the place to find out. Through a highly-readable discussion of the refinements developed by scientists from all over Europe, the text moves into the definition of an assay balance, helpful because of the frequent confusion with its better-known lineal descendant, the analytical balance.

What makes this book stand out among the handful of scholarly books published on scales is the skill with which the Shannons have managed to present both the scales and their makers in the context of their time and place. There are lively accounts of daily



Maison Exupère of Paris (Aubry & George, success-ors) assay balance of 1928. With additional glass dome to keep off the draught. Note the particularly long pointer, going up to the ivory chart. Agate bearings. Capacity 2 grammes, sensibility 1/20 of a milligramme.

life in the mining communities as well as the political and technological reasons for the emigration of many European scalemakers to the United States. Much of this information has been gleaned from unpublished family sources and obscure publications. For example, the intimate business and family relationships of the Denver and Salt Lake City assay balance-makers have not been published elsewhere, and there is much new background on the Troemners of Philadelphia. Likewise, much information previously scattered over many issues of Equilibrium and more obscure sources has been collected in one place, including the best coverage of the complex history and interrelationships of the Becker family of scalemakers that I have seen. Because of the tremendous influence of European scalemakers on American assay balance design and construction, there is also useful material on Ludwig Oertling of London, and Paul Bunge and Wilhelm Lingke of Germany.

This is handsome, well-designed volume, with high-quality printing, paper, and binding. Numerous previously-unpublished photographs and engraved illustrations complement the text, which is accompanied by an extensive bibliography and a thorough index. The inclusion of reprints of five scarce assay and chemical balance catalogs from the Shannons' collection, as well as catalog selections for other turn-of-century scalemakers, is worth the price of the book alone. The catalogs included are: Kohlbusch-1888, Voland and Sons-c1913, Ainsworth-1903, Smith and Thompson-1898, and the Denver Balance Company-1905.

This book is obviously a labor of love, well-researched, well-referenced, and skilfully written. It will be valued by not only collectors of assay and analytical balances, but also those interested in the history of 19th and early 20th century American technology. With the publication of this seminal book, the Shannons are bound to receive additional new information, which will hopefully lead to an enlarged edition. Its availability will generate even more interest in the collection and study of assay and analytical balances and their makers, and the limited supply will likely be depleted soon.

By S BEARE

This anonymous English bismar, nearly 7 ins. (170mm) long, was made during the latter part of the 18th century, judging by the method of manufacture and the imitation-leather case. There is very little room in the case for a hanger or clip. The beam is graduated on the visible surface 6, 5, 4, 3, 2, and 1 [grains] x quarters. The back side is graduated 3, 2, and 1 [grain] x quarters. There is little sliding weight on the beam, but its function in conjunction with the bismar is not understood, but might be for weighing in air and water. The saddle is split underneath and forced onto the beam, to form a tight fit when it slides into the notches in the beam. The shears and pointer fold flat against the saddle for storage. There is a steel pip under the beam to prevent the sliding weight coming off, and a similar pip to prevent the saddle coming off. It has steel knives but no steel bearings. It might be considered to be an assay balance because of its fine sensitivity. Courtesy F Wallis
Photo D Crawforth-Hitchins

Rolamite Postal Scale

BY C LUSHBOUGH

This scale appeared on my workbench, after my wife DeVee's weekly trip to the Mile High Flea Market, with this note attached. "Here's one that you don't have". She was right. It was obvious that this one is very different from other scales in my collection. It consists of two big cylinders, a small roller, a pointer, a piece of chain, and a piece of silvery plastic tape wrapped around the cylinders. There is a Postal Rate Scale graduated in one-half ounce increments and giving First Class, Air Mail, and Third Class rate schedules, based on the 10 cents per ounce rate in effect in 1977. There is a zero adjustment knob at the base of the rear. The interior parts are made of a black plastic. **U. S. Patent 3,621,928** is molded into the pedestal supporting the lower cylinder. The entire mechanism is enclosed in a clear plastic cover about five inches in each dimension. This cover rests on four knobs molded into the edges of the black plastic letter-plate. In the center of the cover is a square opening about three inches in diameter exactly made to fit over the letter-plate. The sides of the cover are permanently attached by a snap-lock mechanism. When a load is placed on the plate, the movement is very smooth and has a "springy" feel.

There has been no attempt to take the scale apart; therefore, the assembly of the numerous parts is definitely uncertain. But after a couple hours of pushing the letter-plate up and down, turning it over and around, and using a magnifying glass, I determined how it works. For one thing, it works as well upside down as it does right side up!

This is where you will need to put on your thinking cap and study the Cover Picture. The movement is easy to see, but how it moves is the interesting part. The weaving of the plastic tape around the three tubes is the key. (Fig. 4 will explain the wrapping process.) The bottom cylinder does not roll. It is fixed to the base with a screw or rivet. The top cylinder does not roll, but it does move down and forward when the letter-plate has a load placed on it. The small roller does roll between the two big cylinders. As the small roller moves, the pointer fixed to its end moves down in an arc. The movement of the plate is limited by hitting the top of the postal-rates chart. The plastic tape must have the proper tension to keep the small roller in contact with the two larger cylinders. (This is why I have not attempted to take the scale apart.) Now where does the spring fit into this picture? On the small roller at the horizontal center is a cam with a chain attached round its perimeter. This chain is attached to a vertical spring in the center (hidden from view) of the large bottom cylinder.

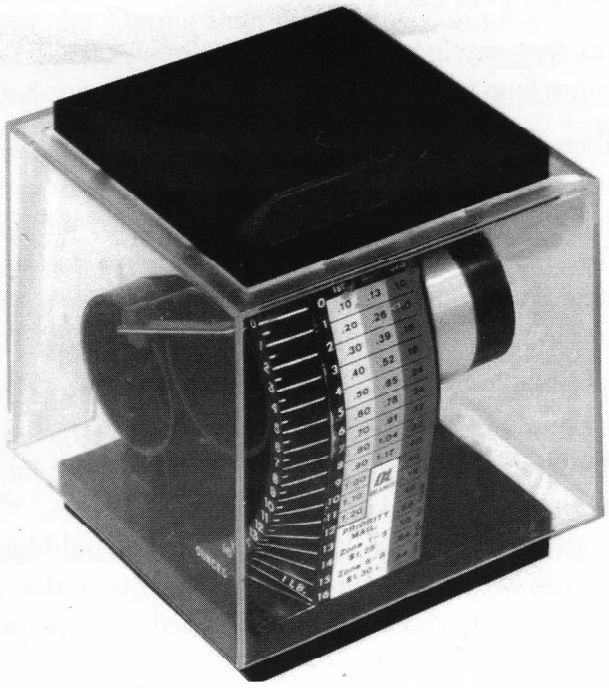


Fig. 1 ➤➤ The author's Rolamite complete with its transparent cover hanging from the letter-plate. The graduated chart has a secondary chart at the bottom giving prices for priority mail Zone 1-5 $1.25 and Zone 6-8 $1.30. The normal rates for 3rd class go from 10 cents for 1oz to 64 cents for 16oz. The chart has background colouring of sky-blue, sax-blue and turquoise-blue, the latter being behind the 3RD class rates, and thus making the 3RD class rates the hardest to read.

Photo C Lushbough

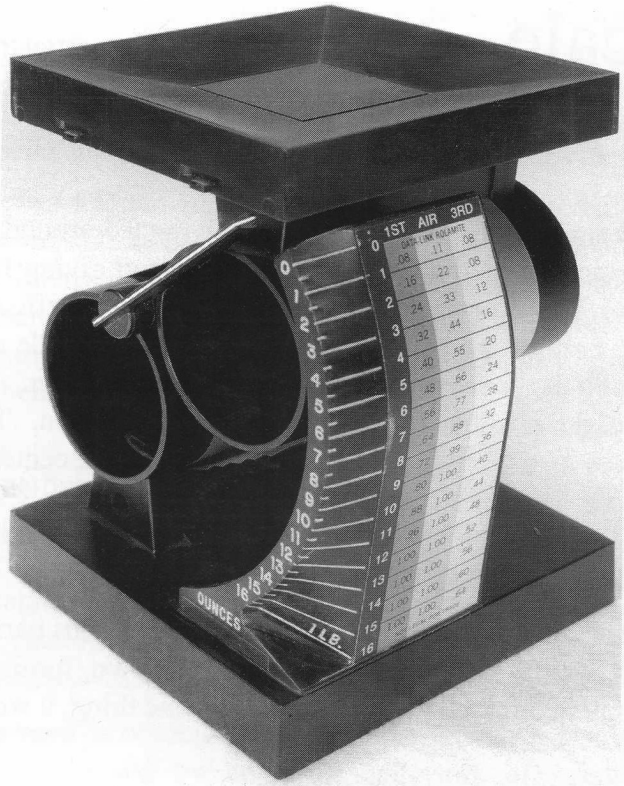


Fig. 2 ≺≺ An earlier Rolamite with the cover removed. The lugs from which the cover hangs are visible along the left lower edge of the letter-plate. The corrugations in the plastic tape are visible below the upper cylinder, the corrugations being there to minutely tighten the ribbon. The graduated chart has a chamfered moulding subtly curved to enhance an already fascinating combination of black cylinders and silvery tape. The graduated chart has DATA-LINK ROLAMITE printed just below the headings 1ST, AIR and 3RD. The 3RD class rates go from 8 cents for 1oz to 64 cents for 16oz. The chart coloured turquoise-blue, sax-blue and sky-blue, so that the easiest to read is the 3RD class column. At the bottom of the chart is printed NOT LEGAL FOR TRADE. The base has cast into it ROLAMITE INC. SAN FRANCISCO. All the black parts are held together with black plastic rivets, but the perspex cover is glued (presumably with chloroform, the normal glue for perspex).

Photo D Crawforth-Hitchins

Let's take a look at the whole picture now. As you put a load on the letter-plate, the large upper cylinder moves down and the small roller moves in a clockwise direction. This clockwise motion causes the pointer to show the amount of load on the plate. This motion also causes the cam on the small roller to go up and around clockwise, thus causing tension on the spring to equal the load placed on the pan. When the load is removed, the spring goes back to its original position and the pointer goes back to zero.

As they say in physics somewhere, "Eureka! The system is explained!" This explanation may be more than most people would want to know, but for me it was one of those "need-to-know" things.

Eager to show off my new treasure, I presented it at the recent ISASC convention in Seattle. Two or three others have scales like mine, but no one knows very much about them. Then things really began to happen. Norm Cima explained the rolamite technology and provided the website of the Technical Research Library at Sandia National Laboratory, where rolamite was invented and developed. Later, Jan and Bill Berning sent me a copy of the paper work that came with their scale.

"You have just purchased a scale that makes all others seem quaint by comparison," says the brochure. "Your new scale embodies many of the advantages of rolamite geometry, such as rolling motion to reduce friction and inherent design simplicity . . . Minor adjustments, up to four ounces, may be made with the knob located at the base of the rear of the scale." The copy goes on to explain that this is more than a postal scale. "That adjustment," it said, "along with the unique, ridged shape of the weighing surface, would be particularly useful in weighing articles of various shapes without including the weight of the container." The maker, identified as Data-link Corporation of San Diego, promised to supply a new postal rate schedule for $1.00 in the event of there being a change in the US postal rates.

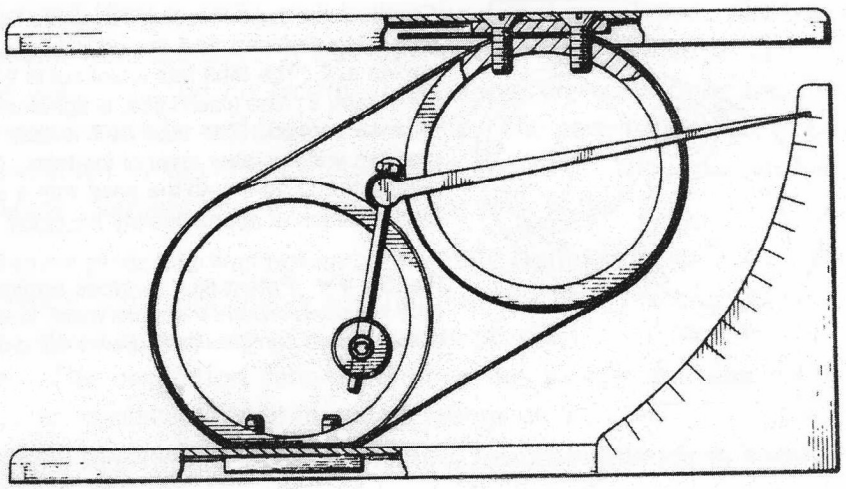


Fig. 3 ➤➤ Side elevation, partially in cross section, of a weighing scale in accordance with this invention. Although the patent indicates a pendulum system, a spring was substituted before the scale went into production. With the possible exception of a laboratory model or two, the scale was never produced with a pendulum.[3] Note that the upper cylinder is mounted off to the right of the centre, in such a position that it would fall if not held up by the pendulum's poise (and by the spring, in the production model).

Suddenly I was deluged with tantalizing bits of information. My scale had a name, a date, a maker and his location, and an intriguing connection to Sandia National Laboratory and the Atomic Energy Commission. Next. I examined a copy of the patent, US Patent 3,621,928 for *Weighing Scales of Force-balancing Type*.[1] It was issued on Nov. 23, 1971, to Carleton W Sprague of Albuquerque, New Mexico, and assigned to Rolamite Inc. of San Francisco, California. That patent cited as references United States patents issued in 1899 and 1926, an Austrian patent issued in 1926, and a German patent issued in 1942.[2]

In addition to the differences mentioned in the captions of Fig. 3 and 5, the zero adjustment wheel (tare screw) is not shown on the patent, because it shows a simple pendulum scale which cannot be tared. The plastic case is not mentioned. The graduated chart is in a different position. It is interesting to me to see how different the final product was from the patent description.

A couple of trips to the library, a few hours on the internet, and many e-mails and faxes have added to the Rolamite story. Sandia National Laboratory, located in Albuquerque, New Mexico, is one of three national laboratories funded at that time by the Atomic Energy Commission to develop new technologies for utilizing energy.[4] In order to justify their continuing need for research and development funding, both the AEC and the National Aeronautics and Space Administration (NASA) adopted the policy of sharing any discoveries having commercial value with U.S. industries.

Rolamite appeared made to order for that purpose. It is an oscillating (non-rotary) roller band device, invented in 1966 by Donald F Wilkes, a mechanical engineer at Sandia, while he was involved in the design of permissive action links and environmental sensing devices. In his U.S. Patent No.3,452,175, issued June 24, 1969, he called it a *Roller Band Device*, but a short time later he named it *Rolamite*. He developed the technology to serve as an inertial switch for weapons "safing," and later incorporated it in a variety of stockpiled nuclear weapons. The oscillating Rolamite device can function as a bearing, a shock absorber, a spring, a switch, or in numerous other applications.

The system in its simplest form consists of a boxlike rectangular cage within which two cylinders are held by the opposing curves of an S-shaped strip of springy material. The cylinders move back and forth freely but their motion is almost without friction because the area of contact between strip an rollers remains the same at all times.

In December, 1967, Wilkes described his roller-band device in a report published by *Sandia.*

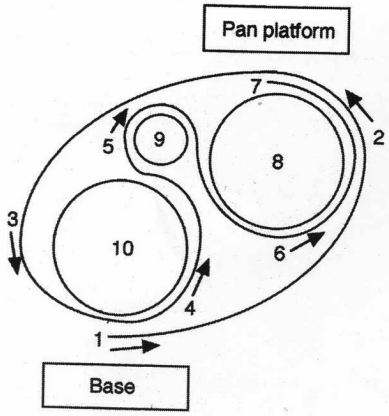


Fig. 4. ⋖⋖ The author examined his Rolamite without peeling back the plastic tape. He deduced that the plastic tape starts at **1** and follows the numbered arrows to **7**. The tape has a slot cut in it at **5** to allow the cam to protrude to the left of tape **9**. The plastic tape is tightened so that the roller and the cylinders are in close contact. The tape at **7** is then fastened to **8** by a screw through the platform and the other layer of the tape. The tape at **1** and the other layer of tape is attached to **10** and to the base with a screw. The pointer is attached to **9** in a clock position of approximately 2 o'clock.

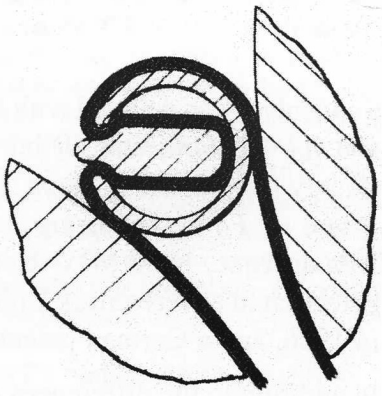


Fig. 5. ⋎⋎ Patent fig.# 4- cross sectional view of the scale showing how the tape is wound around the small roller, to which the pointer is attached. The route is even more complex than previously diagnosed.

Articles in popular technical journals heralded the invention as a new mechanism as basic as the lever, spring, or hinge. One writer described it as the 26th fundamental mechanism of all time, and the first basically new such mechanism since the clutch, which was invented before 1814.[5]

But this article is about one particular application, the Rolamite Postal Scale that mysteriously appeared on my workbench. Information about Data-link Corp. of San Diego, the maker of the scale, has been hard to find. Bill Berning mailed a $1.00 check to the San Diego address requesting a new postal rate chart, but the letter was returned. Telephone calls to Data-link listings in San Jose, California and in other states turned up nothing useable; the firms currently operating under that name were not in business in the 1970s. My inquiries seemed to have reached a dead end. Then, referring to material I had found on the internet, I contacted Dean E Gladow. Now semi-retired, he was actively involved in the Rolamite research and development from beginning to end. He generously shared his recollections of those years.

In late 1967 or early 1968, even before the Rolamite technology was patented, a San Francisco entrepreneur, Paul Hanson Jr, recruited Wilkes to help him establish a new corporation, Rolamite Inc., for the purpose of commercializing the technology. With the approval of both Sandia and the AEC, Wilkes recruited Gladow, who in turn recruited other Sandia engineer-inventors including Carleton W. Sprague. Gladow reflects that Sandia's enthusiasm for the venture may have waned as the number of departures increased to thirteen. Hansen ran the San Francisco business office with a small staff while the others remained in Albuquerque to continue their research.

Their firm offered *Inventions on Demand*, a service in which they worked with business and industry leaders to learn their equipment-needs, designed a product to meet those needs, and then built a prototype. The client was responsible for producing the actual devices. Within the next few years about twenty patents were issued. The inventions recalled by Gladow include door locks, hinges, pressure gauges, automobile air bags, and Sprague's Rolamite Postal Scale. In each case, the inventor assigned the patent to Rolamite, Inc.

In addition to Inventions on Demand, the firm had two products to sell: a Rolamite Demonstration Kit, purchased by companies and individual engineers interested in applying the technology to new products of their own manufacture, and the Rolamite Postal Scale.

The scale went into production around 1969 or 1970, well before the patent was issued. The cover was added to protect the mechanism from damage. A tare-adjustment was provided so that any container of up to 4oz could be used. Having no facility for building the scale in-house, they modified the design so the letter-plate could be molded out of plastic. The parts were made in Los Angeles, and the scales were assembled by Goodwill Industries in Oakland. They marketed the scales through mail-order catalogues, charging about $12 to $15 for each scale.

Despite its early promise, the rolamite principle was not an outstanding commercial success. Most mechanical devices rely upon rotation to transfer energy and motion; rotation is provided by roller bearings, cams, gears, and many other common devices. Rolamite provides oscillation, but does not effectively provide rotation. The oscillation cannot continue indefinitely, and the rolling action, although very low in friction, is susceptible to minor variations on the contacting surfaces (contaminants, scratches, etc.), which become critical on the typically tiny motions of seismometer pivots.[6]

Unfortunately, the business was not profitable, and in 1972 Rolamite Inc. merged with the Foothill Group of Southern California. The Foothill Group then assigned the Rolamite Postal Scale patent to Data-link Corp. of San Diego, who manufactured the scale from 1972 through 1976. And what was their marketing strategy? They sold the actual scales to the U. S. Post Office Department, who placed them along with other items for sale in the lobbies of post offices throughout the Midwest and presumably elsewhere.

Here is how to date your Rolamite Postal Scale if you are fortunate enough to have one:
A pendulum mechanism rather than a spring would indicate it to be one of the two or three lab' prototypes ever produced - a real treasure! A scale lacking the patent number would have been produced by Rolamite Inc. between late 1967 and Nov. 23, 1971. Presence of the patent number indicates manufacture between Nov 23, 1971 and 1977. Scales having paperwork or scale stamped with the name Data-link were sold between 1972 and 1977.

The rolamite invention is certainly unique. I'm not sure of its place of importance with other fundamental inventions. Regardless of its place in metrological history, it was enjoyable to figure how this postal scale operated. Also, my wife's saying "Here's one you don't have" was certainly true and then some!

Biography

Cliff Lushbough devoted 33 years to teaching chemistry and mathematics to high school students, during which time he developed a fondness for the various scales and balances, and gathered information about them from the people who serviced them. When the schools were converting to electronic equipment, he acquired the discarded substitution, chain-a-matic, torsion, and analytical balances for his own collection and his wife DeVee started bringing scales from the flea market.

He also collects stamps showing scales or chemical formulas, names, and structures. He developed the "Balancing Act" presentation that he now gives before community groups of all kinds: service clubs, senior centers, lodges, churches, and family get-togethers. He places scales on each table, encouraging the diners to play with them, then he goes from table to table talking about them or he displays a group of scales and asks the audience to examine them before his presentation. He encourages ISASC members to develop their own Balancing Acts as a way of sharing their personal appreciation of scales.

Notes & References

1 A force-balancing scale balances the weight of the load against the resistance being provided by a counterpoise, spring, or other device—in short, the definition of any weighing scale. Use of the term here is an example of legal redundancy.

2 Prior patents cited include the following:

US Patent no. 638,596, 12/01/1899, to Reisert. First patented in Germany in 1891. It has a rolling strap going round two drums to convey movement from the scale (first drum) to the counting or recording device (second drum). The scale is a half-roberval and pendulum with a pointer moving over a graduated arc, complete as a weighing device (and a very early example of this principle) .

US Patent no. 1,661,291, 03/19/28, to Joksch. I know nothing of a 1928 patent, but Joksch did get a British patent in 1911, described in EQM 677, 688. It is a half-roberval and pendulum, of a very crude type, so I suppose it does approximate a parallel linkage with force-balancing.

Austrian patent 104,545, 05/1926. Not seen.

German patent 731,150, 12/1942. This appears to relate to a top-pan rollwaagen, but the correct date is 11.21.1940.

3 Gladow, D E, Personal communication. He was part of a team of Sandia engineer-inventors working with rolamite inventions including the design of unattended seismic stations, geophones and pressure instrumentation, etc.

4 The other national laboratories are located at Los Alamos, New Mexico and Livermore, California. In the late 1970s, they were placed under the Department of Energy.

5 Wilkes, D F, "Rolamite, A New Mechanical Design Concept", *Research Report SC RR-67-656A*, Sandia Laboratory, December 1967; *Science News,* Oct 28 1967; *Scientific American* Dec. 1967; *Aviation Age,* late 1960s, *Popular Mechanics* Feb, 1968; *Popular Science* March, 1968; Sandia National Laboratory Technical Reference Library, http://infoserve.sandia.govlinks.html; Gladow, D, "Flexures-YES," *PSN-L Email List Message*, 1999; *Scroller Wheel Report*; www.ids.bc.ca/scroller/patent.html Internet www.altavista.com

6 By the 1990s, however, the rolamite inertial switch had found commercial application in the deployment of automobile air-bags. It could be manufactured so small that a magnifying glass was needed to examine its workings. The device is also being used in optical devices and as a safety for the trigger in H-Bombs.

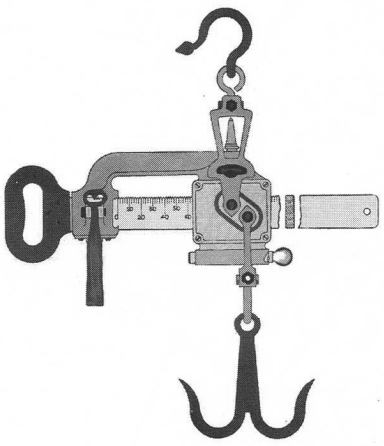
Repairing Saddled Steelyards

BY G NEWALL

The article on page 2381 reminded me of the only example of a saddled steelyard I have encountered. Of the drawings in the article, that of fig. 14, page 2386, is the nearest to what I remember. The blade was something like 3 x $^{3}/_{8}$ins in cross-section with a handle as that at **C** for drawing the blade through the saddle. I do not recall a second handle as that shown at **B** which is for lifting the pawl.

It came into the workshop to be repaired, so it was repaired, restamped and returned to a (hopefully) satisfied customer. As near as I can remember, this was in 1950.

In parenthesis, around that time it was not unusual to be asked to repair butchers' steelyards that were graduated in stones of 8-lb. Naturally this work was declined, but it was obvious that the machines had been in use only days before.



Day & Millward Ltd. butchers' steelyard approved by the Board of Trade in 1919, graduated in 10-lb x 1-lb..

Saddled Steelyards, 1922

BY G A OWEN

The steelyard arm itself forms the movable weight; it slides through a slot cored in the box which carries the two pairs of knife-edges for the fulcrum and load shackle respectively. This construction offers several advantages: the heavy balance weight and the poise weight are dispensed with; the readings are always taken at one point; deflection of the arm is greatly reduced.

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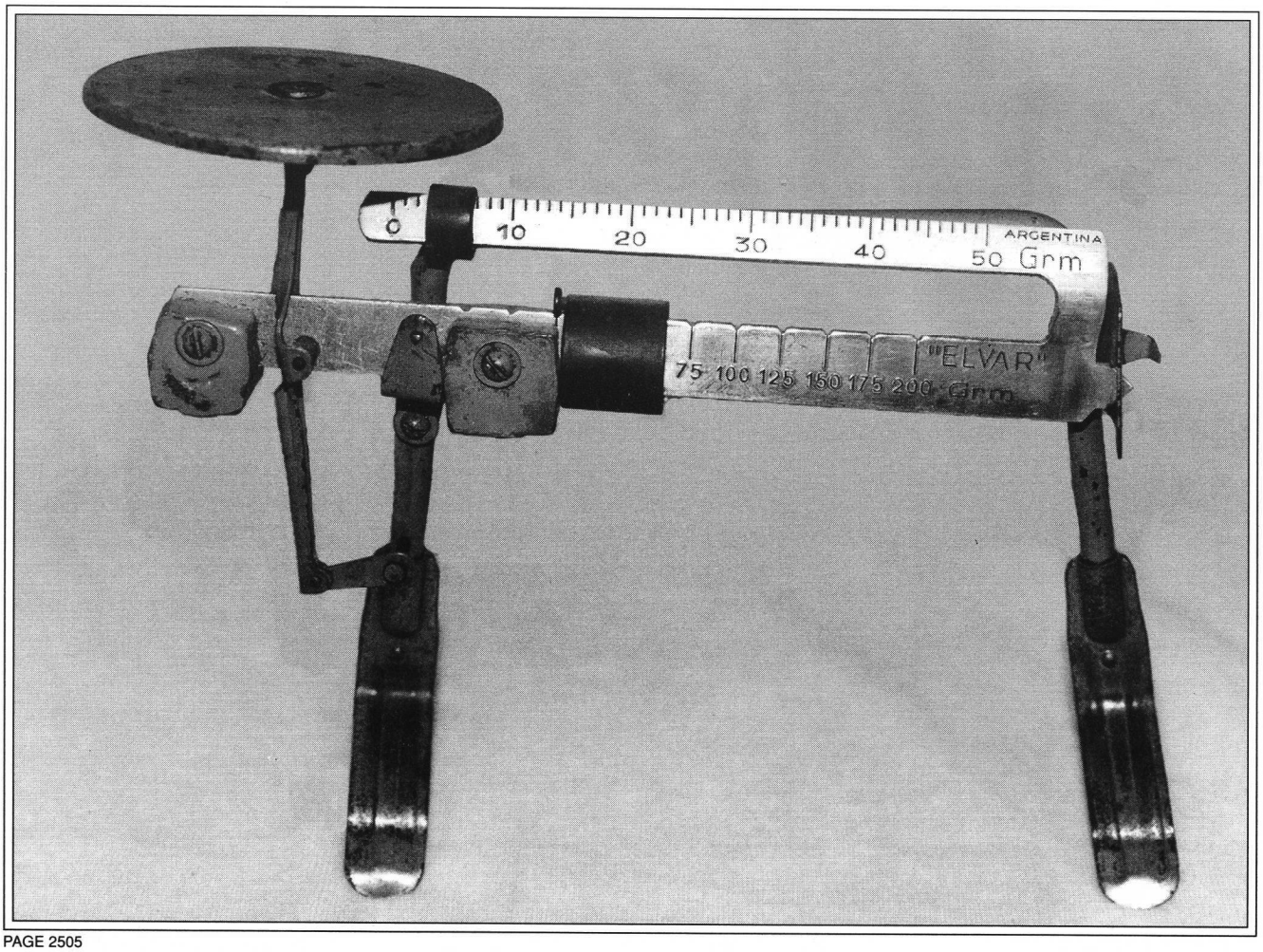

Cover Picture

The "ELVAR" is a double-beam steelyard and half-roberval made in Argentina. The upper beam is graduated from 0 to 50 grams by 1 gram. The lower beam is graduated from 0 to 200 grams, giving a combined capacity of 250 grams. Thc scalc is painted robin's egg blue, the beams are aluminium, the stands seem to be brass and the poises are copper. It is 7fiins (190mm) high, 3fiins (33mm) deep and 9fiins (242mm) wide.

Can any reader tell us who made it, or explain its purpose?

This is an example of the ephemeral that adds so much to our subject. Here is a flimsy scale intended for relatively brief use, yet it follows an honourable tradition of double-beam steelyards that give greater precision in read-out than a single beam of that length could give.

Sent in by VERNON DENFORD

Editor: Readers will notice that two sets of spelling rules are being followed in EQM. The articles from American authors use American spelling and grammatical rules. All other articles follow British practice.

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Weights of the Bible

BY L HOLLAND

Units of weight are frequently mentioned in the Bible. Among the units mentioned are:

Shekel (Hebrew: sheqel --- Genesis 23:16);
one-half shekel (Hebrew beqa' --- Genesis 24:22, Exodus 38:26);
two-thirds of a shekel (Hebrew pym --- I Samuel 13:21; see below),
one-twentieth of a shekel (Exodus 30:13) or a Gerah (Hebrew gerah)
Talent (Hebrew: kikar) of three thousand shekels (Exodus 38:26).

From the context in which these mentions occur, it is clear that before the invention of money around the 8th century BC, payments (of tax, or in commerce) were made by weighing out silver or gold; and that the Hebrew weight-system used when the Old Testament was written, was derived (like most weight-systems in the ancient Near East) from the ancient Sumerian system (see Tables I and II).

TABLE I. Sumerian (later Akkadian-Babylonian-Persian) Weight System.			
1 Shekel			= 8.3 - 8.4g
60 Shekels	= 1 Maneh		= 498 - 504g
3600 Shekels	= 60 Maneh	= 1Talent	= 29.9 - 30.2kg

In those Bible passages relating to the Tabernacle, or Sanctuary (where the Tablets of the Law were kept), the shekel is always spoken of as *shekel ha-kodesh*, "the shekel of the Sanctuary" or "the shekel by the sacred standard". This might mean that a special "sacred" shekel existed, differing in nominal weight from the shekels of secular commerce (of which there existed a number of regional varieties); on the other hand, it might simply mean that payments in shekels in connection with the Sanctuary were validated by being weighed by the functionaries of that institution (the priests and Levites), using "official" equipment of which they were custodians.

TABLE II. Biblical (Book of Exodus) Weights.
20 gerah = 1 shekel
3000 shekels = 1 talent (kikar)

We don't know for certain the answers to the questions raised above; there are no surviving artifacts from which we could get information. But if we move a few hundred years further on in time, we shall find ourselves on firmer ground. King David's son Absalom (c.1000 BC) had his hair cut, we are told, once a year (2 Samuel 14:26); when the shorn hair was weighed, the weight was "two hundred shekels by the royal standard". The Hebrew phrase is *be-even hamelekh* --- "by the stone of the king" (at that time, weights were made almost invariably of stone. One of the modern Hebrew terms for "a weight" is *even-mishkal* --- "a weighing-stone").

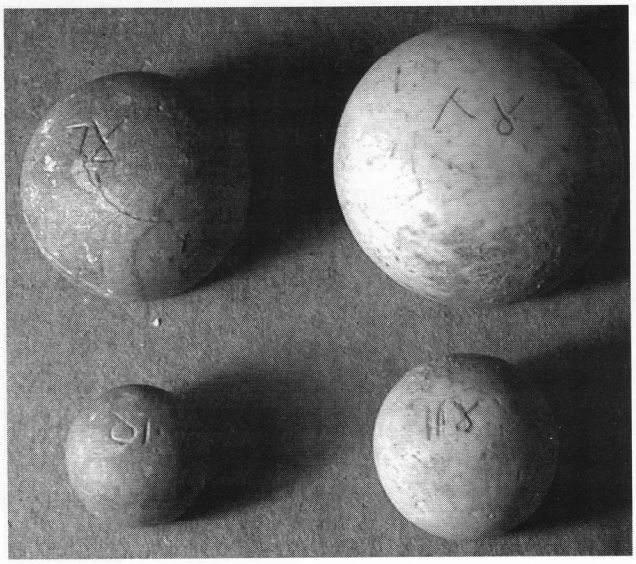


Fig. 1. ➢➢ Top left, clockwise, 4 shekels of pink & cream limestone, 8 shekels of white & sand-coloured, 2 shekels of white & cream and shekel 1 of pink & sand-coloured .

This is the first time the Bible speaks of a Hebrew weight issued by a secular authority. And we have tangible archaeological evidence to help us learn more about it. Several hundred weights with Hebrew inscriptions have been

found at archaeological sites in Israel, almost all of them within the boundaries of the ancient Kingdom of Judah (similar weights are known from Egypt and other surrounding countries). Archaeologists date them to a period from the 8th to 6th centuries BC. Three denominations are named: *beka'; pym*; and *netzef.* Besides these, there is a group engraved with a symbol (Fig. 1) that is now believed to be the royal shekel of the Kingdom of Judah.

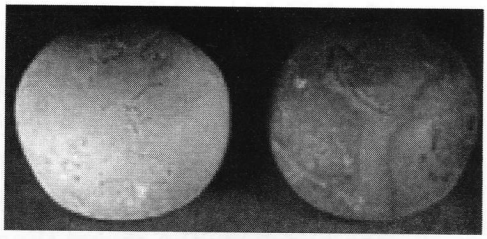


Fig. 2. ⅄⅄ Two examples of a 4 shekel weight, the left-hand one is pure white limestone and the right-hand one is pink and cream limestone.

The Hebrew weights are almost all of limestone (a common stone in much of Israel), carefully shaped and polished. They are round with a dome-shaped top, from which the sides taper down to a flat, circular base. Inscriptions are engraved across the top, in the centre. (Fig. 2, Fig. 3) The individual masses vary considerably, so there is some overlap between the mass distribution curves of the four groups into which they are divided, which are:

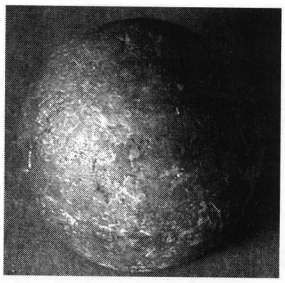


Fig. 3. ⅄⅄ 24 shekels of slate-grey & white limestone about 2fiins dia.

SHEKEL. These have an average unit mass of about 11.4g. In individual specimens, the unit mass varies from less than 10.5g to well over 12g. The symbol they bear varies somewhat in form from piece to piece. (Fig. 4)

Fig. 4. ⅄⅄ 4 Hebrew symbols for a royal shekel.

The denominations are 1, 2, 4, 8, 16, 24 --- i.e., a binary series. This is oddly out of step with the Bible, which always refers to numbers of shekels in decimal multiples. Archaeologists have found an explanation for the inconsistency: The signs indicating the denominations are, in fact, Egyptian symbols for decimal numbers (the lowest denominations are indicated simply by an appropriate number of vertical strokes). Thus the denomination-mark on the 8-shekel weight is the Egyptian "10"; that on a 16-shekel weight, the Egyptian "20"; and so on. This is because the weight of four shekels equalled five Egyptian "qedets". The *qedet* (kedet) was then an important commercial unit of weight in Egypt, and that country did a lot of trading with the Kingdom of Judah; so these stone weights were clearly intended to fulfil the dual purpose of weighing in either Hebrew shekels, or Egyptian qedets. (Figs. 5, 6) Considering the great profusion of different weight-systems in use in this region at that time, this would have been a very handy thing from a trader's point of view.

Fig. 5. ⅄⅄ Two lovely examples of white 2 shekel weights, each about 1 ins diameter.

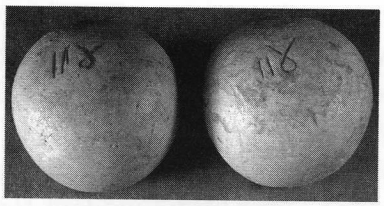
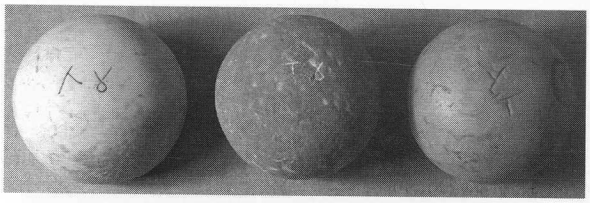


Fig. 6. ⅄⅄ Three examples of 8 shekels, the left-hand one white and cream, the centre one grey and the right one sand with pink streaks.



The identification of these weights as royal shekels is reinforced by a specimen found at Gezer, near Jerusalem, weighing 22,3 g, and marked with two vertical strokes and the Hebrew word *lamelekh* ("of the king"). And as for their relation to "the shekel of the Sanctuary" --- archaeologists speculate about the subject, but the fact is, we just don't know for

certain. We don't know anything, either, about the shekels mentioned in the post-Exilic books of the Bible (Ezekiel 45:12, Nehemiah 10:32). They may have been something quite different again.

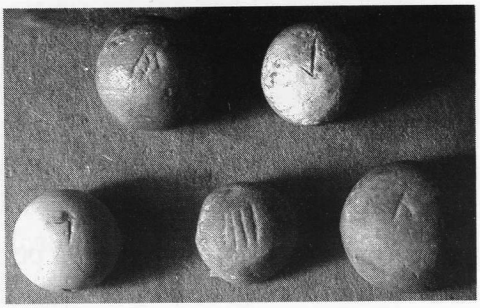


Fig. 7. ⅄⅄ Five gerahs, clockwise, sand, cream and white, grey, pink and cream sandstone, the largest about fiins diameter.

The other three types of weights are known so far only as single units (no multiples have been found). There are also small weights, believed to be shekel-fractions (*gerah*): there is much disagreement among archaeologists about these, and about the exact meaning of marks on them. (Fig. 7)

BEKA. This is half a shekel. The average mass of marked specimens is about 6g --- rather more than half an average shekel. It has been pointed out that it is common for smaller weights to be heavier than expected, and suggested that this is intended to compensate for errors that might occur when weighing small quantities with an insensitive scale. (Fig. 8)

Fig. 8. ⅄⅄ Beka weights, both slate grey, fiins dia.

PYM. (called by Petrie "peyem", but the spelling "pym" is more usual). The average mass of marked specimens is 7.8g. This is two-thirds of a shekel. (Fig. 9) The word *pym* occurs only once in the Bible (1 Samuel 13:21). Its meaning had early translators baffled, and has only become clear in recent years with the discovery of these stone weights (compare the King James Bible's rendering --- which doesn't make sense --- with a modern translation such as the New English Bible, which makes perfect sense).

NETZEF. (Petrie: "necef") This unit isn't mentioned in the Bible even once. The average mass of marked specimens is 9.8g, which is four-fifths of a Royal shekel. (Fig. 10)

Why were all these different kinds of weights in use in the Kingdom of Judah, apparently all at the same time? The answer is that these are simply Hebrew versions of units that were in common use in trade all over the Eastern Mediterranean, some of them for many hundreds of years before the Israelites arrived on the scene. All of them are related to each other in simple arithmetic ratios, as commercial common sense would dictate. 40 average royal shekels, 50 netzef, 60 pym, and 80 beka, all weigh within ± 20g of 470g, which is the weight of the maneh (mina) of 50 Syrian or Ugaritic shekels --- one of the most ancient of all systems (Table III).

Fig. 9. ⅄⅄ Pym of grey lime-stone, 4/5ins dia.

The netzef can be seen, in fact, to be of the same mass as the Syrian unit, as is also the Egyptian qedet (which, some scholars today believe, may have been brought to Egypt from the north and incorporated by the Hyksos, or Shepherd Kings, into the Egyptian system).

One final word about ancient standards. The statement "the average mass of all marked shekels is 11.4g" means just that. 11.4g should not be thought of as a "standard" or norm --- it isn't. "The shekel of the king" was whatever the weighing-stones which the king's officials were using at the time weighed; if you were paying taxes to the king, that's what your payments would be measured by

TABLE III. Relation Between Weight Units.		
40 Royal shekels	11.4 x 40	456g
50 Netzef	9.8 x 50	490g
60 Pym	7.8 x 60	468g
80 Beka	6.0 x 80	480g
50 Syrian/Ugaritic shekels	9.4 x 50	470g

..(there are lots of ancient depictions of royal agents weighing out tribute as it is received). Duplicate weights, used by royal officials to collect payment in different parts of the kingdom, would of course weigh more or less the same; just how much more, or how much less, would depend on the precision of the scales used, and on the skill (and perhaps at times the integrity?) of whoever was using them. So even official weights might vary from place to place --- and from time to time, too: King Jeroboam's tax-collectors might be using a set of weights which differed quite a bit from those of his predecessor, Solomon. And if you were a merchant, the weights you used when doing business might have been calibrated against some "royal" weight or other --- or they might not. Another merchant with whom you had dealings could have a set of weights different from yours; the differences would have to be sorted out by discussion, to your mutual satisfaction. The idea of a regional, or national, weight standard, legally binding on all and enforced by official inspection and legal sanctions, developed only gradually, and very much later in antiquity. To attempt to apply "standards" in the modern sense to these ancient Hebrew weights, is wrong. We should always be careful about imputing our own latter-day notions to ancient peoples. Nonetheless, considering what we know (admittedly very little!) about the circumstances under which these weights were made and used, the remarkable thing about them is not their variability, but rather their relative uniformity over a span of several centuries.

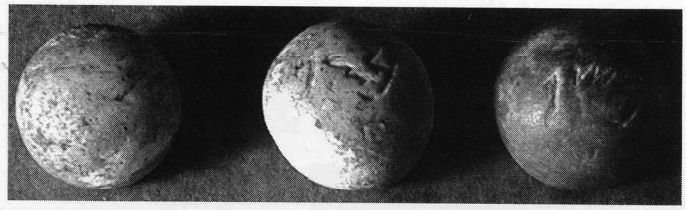


Fig. 10. ^^ Three netzefs, one cream, one cream & white and one slate limestone, about 4/5ins diameter.

Suggestions for Further Reading.

Kletter, R, "The Inscribed Weights of the Kingdom of Judah". *Tel Aviv*: Journal of the Institute of Archaeology of Tel Aviv University, 8: 121-163, 1991.

Petrie, W M F, *Ancient Weights and Measures*. London, 1926. (Note: Petrie didn't know what the shekel weights actually were, and mistakenly called them "khoirine")

Scott, R B Y, "The Shekel Sign on Stone Weights". *Bulletin of the American Schools of Oriental Research*, 153: 32-35, 1959.

Selin, H, (ed.). *Encyclopaedia of the History of Science, Technology, and Medicine in Non-Western Cultures*. Articles: "Weights and Measures in Egypt", "Weights and Measures of the Hebrews", et al. Dordrecht (The Netherlands), 1997.

Skinner, F G, *Weights and Measures: their ancient origins,* &c, London, 1967.

Acknowledgements

All the weights pictured in this article belong to the Rueben and Esther Hecht Museum, University of Haifa, Israel. I am grateful to the University authorities for permission to publish the photographs, and to Mrs. Ofrah Rimon, Museum director and curator, and her staff, for unstinting cooperation and help.

Biography

Lionel Holland, a retired industrial chemist, has lived in Israel since 1953, near the ruins of Caesarea Maritima, Herod's great seaport, where he roamed the dunes (when it was still legal) picking up many of the weights in his collection. He has published articles on weights, numismatics and papermaking technology, and a book (in Hebrew) on the history of papermaking.

A Most Unusual Scale

BY T STEIN

As I mentioned at the convention in May 2000, I was fortunate to find this scale. I saw an ad in the *Antique Trader* for a collection of antique scales to be sold in one lot. I answered the ad and found that the collection consisted almost entirely of cast-iron scales, mostly Fairbanks, Howe, Buffalo, etc. Although it didn't sound as if there was anything I would be interested in, I was curious enough to want to take a look. The location of the scales was approximately 200 miles north of my home, which was a long way to go for most anything, but the opportunity to look at a scale made it worthwhile.

In any event, I looked over the entire collection. As I suspected, the collection as a whole was of no great interest, but there were a few scales that I liked and which they agreed to sell me, one of which was this postal scale.

Fig. 1. ⮜⮜ Henry Weaver's pendulum postal scale, showing the ornamental spelter casing. Photo courtesy N Gluck

The scale is unlike any other I have seen. The heavy spelter case (Fig. 1), which also serves as the frame, is ornate.

The mechanism itself is distinctively different from scales by any other maker. . Three US patent dates are stamped on the letter plate: Nov. 10 1874; July 27 1875; and Nov. 13 1877 (Fig. 2).

By ordering copies of the first two patents I learned that the scale was patented by Henry M Weaver of Mansfield, Ohio. Who was Weaver? In applying for three patents over a four-year period, he must have intended to produce his scale in quantity. What happened to the other scales he must have produced? Can any reader supply more information?

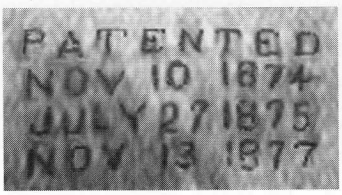


Fig. 2 ⮜⮜ Center of the letter plate.

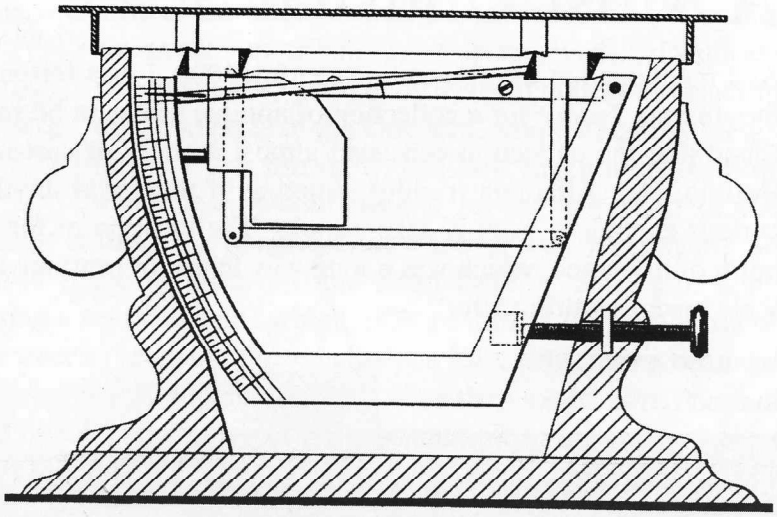


Fig. 3. ➢➢ Weaver's patent of 1874. The patent concerned only the taring of a container. Weaver devotes just one paragraph to his patented feature, the tare-screw at the right side that pushes the graduated chart up, so that, even when a container is on the platform, the pointer still points at zero before a load is put in it. He claims "*As an improvement in letter-scales, a pivoted adjustable dial-plate, actuated by a set-screw, substantially as set forth*". [He uses the word dial-plate where we would use the words graduated chart.] Somewhat surprisingly, Weaver discusses in two paragraphs the positioning of the poise to ensure equal divisions on the chart, even though he does not claim to be patenting this feature. The frame (the casing) has three independent moving structures inside it. The main one is a parallel linkage connecting the platform to the poise, with the pointer attached to the right-hand T-bar. The second structure is a swinging arm pivoted at the top right and not attached anywhere else. The swinging arm has the graduated chart at its left end. The third part is the tare-screw that shoves the chart up at the left when it is screwed into the casing.

H M Weaver Scale

Observed & photographed BY N GLUCK

Although the letter plate of Henry Weaver's scale bears the dates of three US patents, close examination of the mechanism reveals that it was, in fact, built according to the specifications of the earliest patent, No. 156,831, issued on November 10 1874. (Why the two later patents, issued on July 27 1875 and on Nov. 13 1877, appear on the letter plate is a mystery we leave unsolved.)

Weaver's scale is a self-indicating pendulum balance. Weaver states in his specifications that his design is an improvement in weighing of letters and other objects because it has a pivoted

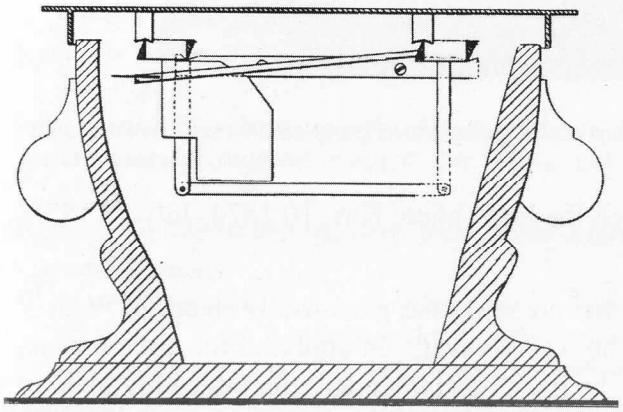


Fig. 1. ⮝⮝ Weaver's patent drawing, showing only the main moving part, the linkage for weighing. It is shown here in the resting position.

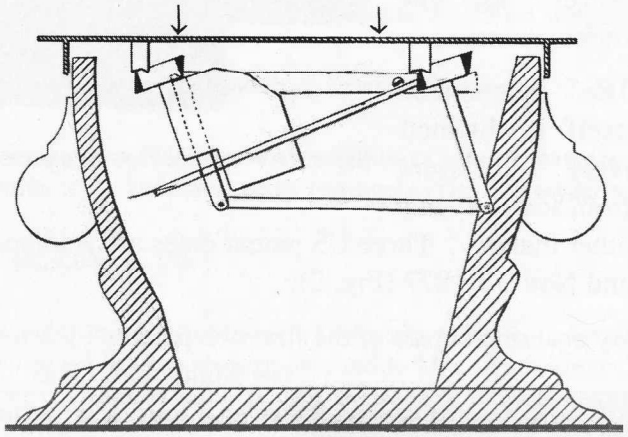


Fig. 2. ⮝⮝ Weaver's patent drawing, showing only the linkage for weighing. It is shown here in the loaded position, so the load has tipped the poise up to the right.

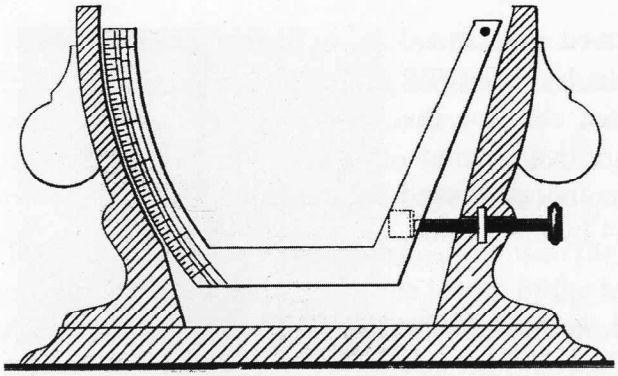


Fig. 3. ⩓⩓ Weaver's patent drawing, showing only the graduated chart with the tare screw that moves it. The screw is not pressing against the chart, so the chart is in position to weigh letters. That is, the pointer will be pointing at zero before a letter is placed on the platform.

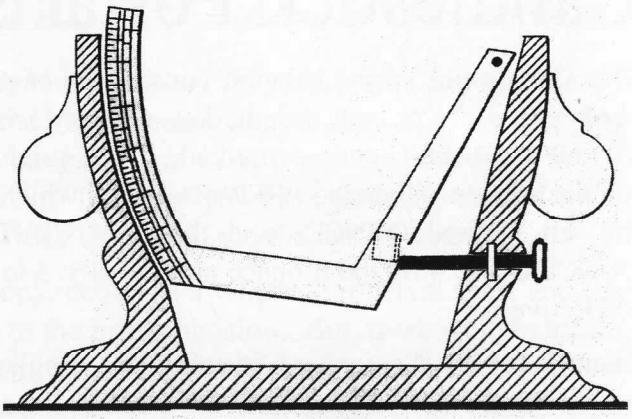


Fig. 4. ⩓⩓ The screw is pressing against the chart, so the chart has moved up. The container intended for the load has to be put on the platform, and the screw turned until the chart has moved up far enough for the pointer to, once again, point at zero. Then the load can be put in the container and the pointer will indicate only the weight of the load.

adjustable dial-plate (chart) actuated by a set-screw. This improvement permits the dial-plate to be adjusted ahead, so the index-hand (pointer) is behind zero, thus permitting a scoop to be zeroed out as a tare weight, and the net weight to be indicated directly. Since all mail is charged by gross weight, he has broadened the use of his system to weigh other items in an additional container.

The Weaver scale has a heavy spelter, one-piece frame in a configuration approximating a square base of about four to five inches and about the same in height. The bottom is open. It has a light brass, square, removable platform with two sheet metal bars riveted to the platform and bent to form four equally-spaced pivots. All sides of the frame are ornately designed. The pointer and graduated chart can be seen through the left front side of the frame. The chart is marked with main graduations of one up to nine (assumed to be ounces as no unit of weight was observed) and subdivided in ⁄ increments. The tare screw used to adjust the chart is shown protruding from the right front side.

There is a steel chassis mounted around the upper inside of the frame which supports an axle through the pendulum weight on the left side (chart) and a T-lever on the right side of the frame. The cross bar of the T-lever is linked by two pins to the lever connected to the pendulum weight. The pointer is connected to the front of the cross bar of the T-lever. The axle shaft to which I referred passes through the pendulum weight at a point that is not its center of gravity. When there is no load on the platform, the weight will seek a position where the heaviest part will seek its lowest position, due to gravity, and where the indicator is at zero. When a load is applied, the weight is moved counter-clockwise and because the axle is off-center, it will seek the lowest position (again, zero) when the load is removed thus eliminating the need of a return spring.

Editor: Spelter, a silvery/white alloy of zinc, has been used extensively in the production of decorative objects since the mid- 19th century. Over the years, it consistently oxidizes to an attractive dull grey patina. Other finishes can also be applied. An object made of it feels heavy in the hand relative to its volume, slightly grainy to the touch, and not very cold. If dropped, it often snaps, but it cannot be soldered together again because of its low melting point. On the other hand, it can be used by manufacturers who do not have access to a high-temperature furnace for casting.

Candlestick Postal Scale

BY J R KATZ

This Candlestick spring balance, constructed of pressed and seamed sheet brass, came on the market recently, made by SAMUEL TURNER, BIRMM, and so marked. The graduated chart on the tubular section is headed PREPAID, under which are two columns, the left marked OUNCES and the right CENTS, and graduated OUNCES: fi to 4 by the fi ounce and CENTS: 3 to 24 by the 3 cents, respectively.

Fig. 1. ⮝⮝ Candlestick postal scale made by Samuel Turner Senior The whole candlestick is about 6 inches high.
Photo courtesy J Katz

Samuel Turner (Senior), of Birmingham, England, worked in the period 1858-1920. From 1845-1855 mail in the US could be sent either prepaid or collect. On April 1 1855, prepaid postage became the standard procedure. Thus the PREPAID heading on the dial was probably used to reinforce that there would be an extra fee for mail sent "Collect on Delivery".

The US rates from 1845-1863 varied somewhat but were based on distance, i.e. less than or equal to 3000 miles and greater than 3000 miles. On July 1 1863, the distance differential was eliminated. All parts of US were 3 cents per fioz. This rate continued until Oct 1 1883.

Thus the scale was one made by Samuel Turner Sr. of Birmingham, England, during the period 1863-1883 and exported for use in the U.S. The U.S. was a bit behind the English craze for little postal scales, but apparently not by much.

Fig. 2. ⮝⮝ Samuel Turner candlestick scale, showing the nicely pressed base. The slot is in shadow, so the spring inside is not visible. The pressure of the letter depresses the spring, (the compression principle) squashing the whole spring into that part of the tube that is below the slot. That is why the slot only extends down only half the height of the tube.
Photo courtesy J Katz

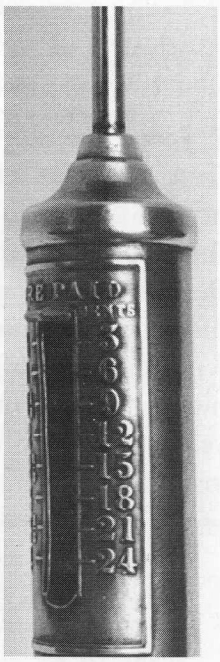


Fig. 3. ➤➤ The graduations on this light candlestick were pressed into the surface of the sheet before it was curved round and soldered into a tube. (The heavier cast candlesticks, also made in Birmingham, had a plate impressed with the graduations, and the plate was applied to the tube after it had been extruded or rolled.)

The rod on which the letter plate sits goes down through the center of the spring and through a hole in the disc at the top of the base. This keeps the rod moving smoothly and vertically, without wobbling. Photo courtesy J Katz

Editor: This is doubly rare. Very few British scalemakers produced candlestick scales for America. And Samuel Turner Sr. made very few candlesticks, perhaps because of the severe competition from Ratcliff and Winfield in his home-town.

Reaction to Comment, 1922

BY G NEWALL

I have owned a copy of Owen's *A Treatise on Weighing Machines* for many years and each time I have read the paragraph on leg and stay mechanisms I have been unhappy. However, my thoughts were always the same: that so few people read the book and even fewer are interested in the mechanics, that it is as well to let sleeping dogs lie. But now you have probably caused more people to read that extract (on page 2488) in one week than read it in the last 25 years.

There are many important considerations in the construction of a vibrating roberval scale and I'm not sure that I would elevate the length of the leg to the prime position. But, if we were to afford it equal importance to the length of the beam from fulcrum to load-bearing knife-edges, we are faced with having one knife-edge bearing on another; a position that is clearly untenable. So, whether we like it or not, we have bearings at the top of the leg. (Perhaps we could have had knife-edges, but I'll mention that later.)

Now the sketch shown in fig. 1 on page 2488 shows the construction used in the vast majority of British scales. It clearly shows the leg steel screwed to the bottom of the leg but, to those unacquainted with the device or those untrained in the reading of engineering drawings, perhaps it is not as clear as it might be that this piece of equipment carries the knife-edge which governs the length of the leg. So the length of the leg is measured from the bearings which sit upon the end knife-edges of the beam to the knife-edge on the leg steel. To achieve the desired degree of accuracy the lengths of the two legs needed to be equal but, even when this was accomplished, an eccentric test could show that both legs were either too long or too short. The remedy for that was to bend the stay so that its central knives were lowered or raised. This equated the distance from the beam fulcrum to the stay fulcrum, to that of the length of the legs.

Mr. Owen expressed his concern that this method of construction was not conducive to accuracy or long life. I encountered a fair number of these scales, nearly all of which were in trade use. Most of the verification stamps were between 10 and 20 years old, with the odd one 30 years or more. On every maintenance visit every scale was tested to ensure that it was within the inspection allowance. Very occasionally a stay needed to be bent a little, but I cannot recall ever having to alter the length of a leg. The treatise was published in 1922 and was unlikely to be written by a young man. It is likely that Mr. Owen's experience was mainly from, say, 1890 to 1920. So improvements in construction from that period to the beginning of my working in 1940 could have helped to enhance the durability of these machines.

My experience has shown me that most people accept things as they are, without question. When considering scales, this majority includes both some weighing-machine men and W & M inspectors. One of the reasons for scales being as they were was the ease of manufacture - otherwise known as the cost of production and, of course, rightly so. But the unimaginative miss the opportunity of visualising the oddities that could be constructed, which may be no great loss, but they miss the further understanding of the principles behind the machines which can be so useful in leading to improvements in a particular case and also in allied products. So: could any member dream up a vibrating roberval scale in which both the bottom and top of the leg carried knife-edges, or perhaps show how a working roberval scale could be constructed with legs of different lengths?

Review

Les Collections Monétaires, Poids Monétaires, 1 - Poids pour Monnaies de France, by Aimé Pommier, published by the Monnaie de Paris, 1999, ISBN 2-11-091772-5, price 150F.

The publisher supplied this description in French: "This work is the first part of a catalogue of the collection of money weights in the *Musée de la Monnaie* [Museum of the Mint] in Paris. It describes weights for French money only. A second part will deal with the weights for non-French money. The overall presentation is particularly clear. The photographs are not isolated in Tables at the end of the book as is so often the case in this kind of publication, but each weight is beside its caption, permitting easy consultation.

The book begins with very useful clues on how to weigh pieces of money. The author criticises some terms often used incorrectly, such as *dénéreux, boîts de changeur* and *Pile de Charlemagne*, which should more correctly be called *Pile étalon de France*. A second well-illustrated chapter refers to a category about which there does not exist any publication yet: the *poids monétaires étalon*, those weights used by the Mint services.

The most important chapter (40 pages) presents the *poids monétaires de circulation*, those to which usually the term *poids monétaires* applies. This is the section where detailed consultation is of particular interest to those collecting money weights and coin-scale boxes. Weights are grouped by types of money. Each type of money and each weight is accompanied by an abbreviated description which gives accurate details. The reader will find in particular details such as period of coin's manufacture, the size of the weight, nominal mass, tolerance of the weight, etc. The catalogue consequently will be very useful to all those interested in money weights, and also a useful addition to publications dealing with money itself."

Taking a weight labelled "*Franse crown*" from a box by Adriaen Jansz van Keulen of Amsterdam, (who was working in Amsterdam as their adjuster of brass weights from 1683 until his death in 1697) an attempt was made to identify it using Pommier's catalogue. First there was a problem with the name of the weight. There were no crowns in Pommier's catalogue, but, on looking up the word "*ecu*" in the dictionary, it is defined as a shield or a crown. Amongst the *ecu au soleil*, Pommier 261, there was the shield with crowned F on the left, and crowned C on the right but no A at the bottom as this example has. Pommier does not explain why the initials FC are there.

Pommier explains that this ecu coin has a crown with a double bow (*fermée*) above the shield and above the crown (on the coin) was a little sun, thus giving it the name ecu with a sun. He gives mass, dimensions, description of obverse and reverse of the weight in the collection.

Pommier shows no weights made by any adjuster for Amsterdam, so a stray weight with the Amsterdam shield with its three crosses in a line down the centre of the shield, (of which there are many in existence) would not be identified by using this book.

ISASC members will already respect the huge contributions made by Aimé Pommier towards our knowledge of French scales and weights, through his beautifully-presented books. The French must be very proud to have such an advocate. This book gives us clear illustrations of 535 weights, many of them shown from both sides. A collector has a good chance of finding an example with which to compare his weight.

The French can be pleased that their Mint has published their collection. The British Royal Mint has a similar collection but it has never been published. One regrets that the French Mint did not

photograph each coin to go alongside the description that forms the heading, a numismatic description not being nearly as useful as a picture.

The first chapter discusses the weights, ordinances, units of mass, tolerances, makers (in general, not specific names), need for weights and their decline. The second section of Chapter 1 explains how to use the catalogue, and what the abbreviations mean. Chapter 2 explains the marks cited, a necessary list as there is no explanation in the captions of who, for example, used A crowned. Be prepared to thumb backwards and forwards a lot! The flyer does not mention the useful small chapter 4, covering other weights used by the services relating to money, dealing with grain weights, sub-divisions of grammes, assay weights, bankers' weights, multiples of grammes, and tolerance weights. The indices include a glossary, rulers of France, and a brief bibliography.

We need a book that moves forward from Dieudonné's thinking in *Manuel des Poids Monetaires*, written in 1925. This book does not do that significantly. The weights from any one set, by one maker, have been separated to appear under the heading of the coin they weigh. The weights from any one region have been separated, so one cannot work out which coins were circulating in a region, or determine which coins any one maker thought essential in his box. The dates of production of any one weight are only given if the dates of the maker are given. Thus one cannot work out how long a coin was in circulation.

Taking a *Louis d'or* weight with German writing on it, an attempt was made to identify it using Pommier's catalogue. As it was dated 1772, it was easy to go to the late gold coins and find that this is a weight for a *Louis Mirliton* of Louis XV. Pommier explains that in the crowned cartouche is a crowned eagle holding a sceptre and globe, in front of a bunch of draped lances and canon, very helpful in understanding the elaborate reverse. But to identify the country of origin it was necessary to go to the catalogue of *Waagen Auktion Essen* of 23 May 1990, that stated that the weight was made in Brandenburg. Both catalogues assume that the reader knows that *Passir Gewicht* means that the weight has not the mass of a new coin but has the lower mass at which the coin was permitted to pass (be used).

A *Louis d'ecu* weight by Gerard de Corduanier of Bruxelles is shown as 392, but are there any more weights by him? What other weights were needed in Brussels? When were they needed? Is 422 a Brussels weight? The author gives no clue. The *ecu au soleil or* was minted between 1475 and 1541, yet Jean Robert of Lyon made a weight for it somewhere between 1663 and 1705. Does this weight come from one of Robert's boxes that he so clearly dated? The author fails to give this extra clue to contemporary usage.

The British weight shown as Pommier 367 has already been classified and numbered as Withers 1296, but no reference is made to this internationally-accepted system. Why did Pommier not useWither's *British Coin Weights*?

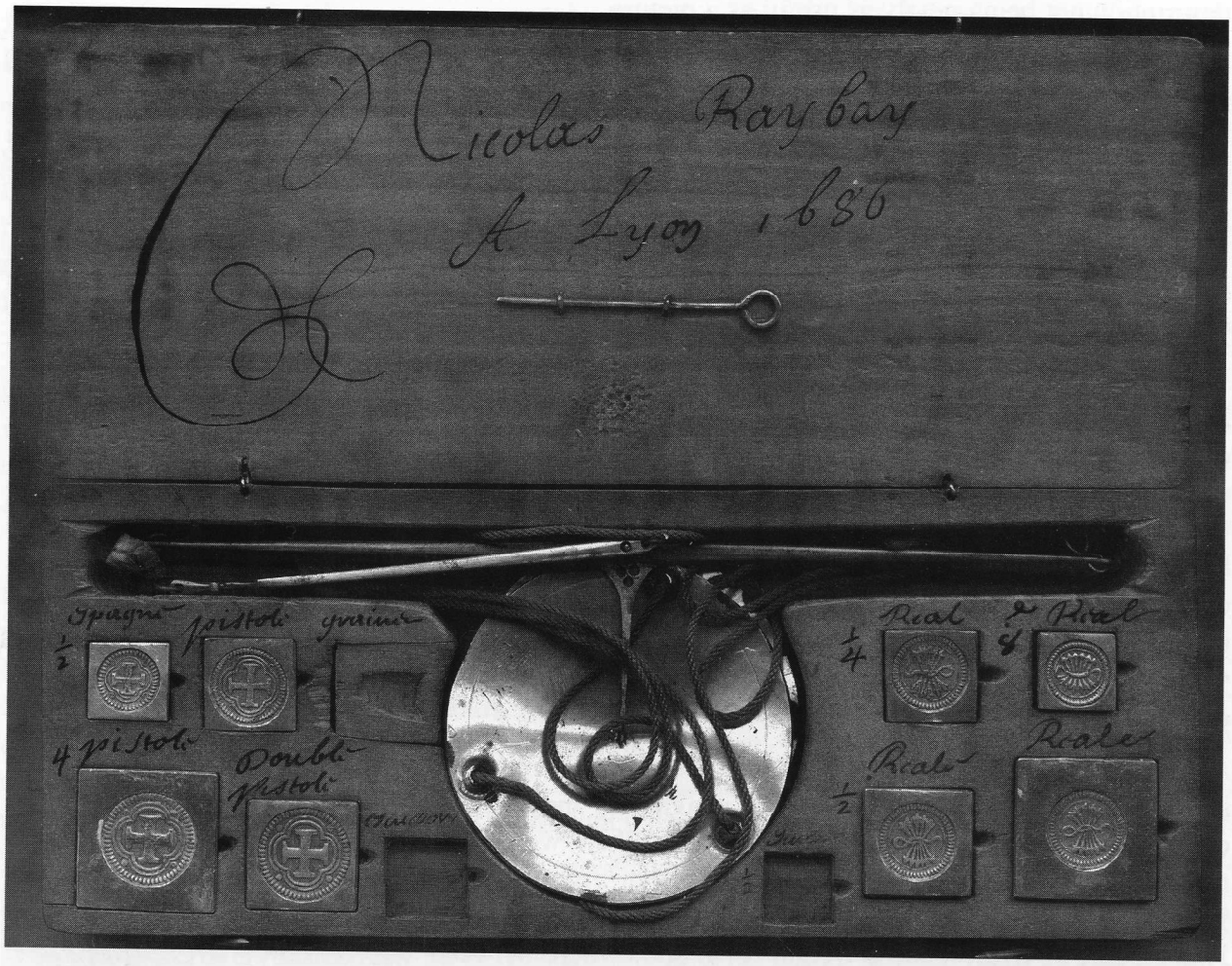
So, is this book useful? Undoubtedly, within the parameters set by the author. It is the best book available for the collector of French coin-weights, and is a very reasonable price for such a glossy production. Get it, and you will use it. D F C-H

Acknowledgements

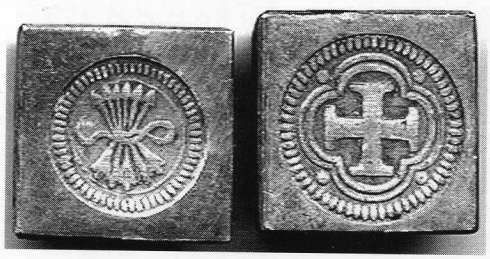
With grateful thanks to Hanns-A Lentze for his translation of the publisher's flyer.

Dieudonné's *Manuel des Poids Monetaires* has been translated into English. The work was begun by George Mallis and Ralph Lipfert, carried on by Ralph after George's untimely death, and now Gloria Lipfert has taken responsibility for it. We look forward to the publication of this much-needed reference book.

French coin scale for foreign use?

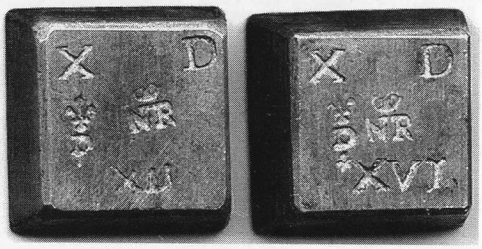


A French coin-scale by *Nicolas Raybay A Lyon 1680* showing the sort of box from which the *Monnaie de Paris* got their weights. Box 7" x 2.2" (178mm x 68mm). The centres of the pans are stamped crowned NR. The pointer has three holes drilled decoratively near its base. The beam ends are flattened and drilled with two holes through which the suspension figure of eight is looped. The writing often fades in these early boxes, but much has survived in this box. On the left the weight-holes are labelled fi Spagne, pistole, graines, 4 pistole, Double pistole and possibly [Gui dor]. On the right, the holes are labelled/Rial, $^1/_8$ Rial, possibly [fi Gui], fi Rial and Rial. If these weights were separated from their box, it would be impossible to date them accurately.



On the left is the fi Rial weight, and on the right is the Double pistole. On trying to identify the pistole weights using Pommier's catalogue, only one example, 364, showed the cross with pellets in the corner. Pommier identifies it as a *Louis* of Louis XIII's period (1610-1643). So did this coin have two names? Hunting through the book, Raybay's design is shown, in a box by André le Fran

(who also came from Lyon). André le Fran labels the coin [illegible] *Spagne*. On reading the caption, Pommier does not identify the various coin weights in le Fran's box, so a second hunt was made to find these particular le Fran weights shown individually, but they are not shown. Is it because they are weights for Spanish pistoles, not weights for the Double Louis?



On the left is the reverse of the Double pistole, with X D [ten deniers)] fleur de lys with D under it, NR crowned, and XII [twelve grains]. Pommier states that the Double Louis should weigh 10 deniers 14 grains. So is this coin a Double Louis with two grains allowance for wear? The catalogue does say that the fleur de lys with D under it is the verification mark of the *Cour des Monnaies de Lyon* [Court of the Lyon Mint] and that NR crowned is the personal mark of Nicolas Raybay.

On the right is the fi Rial weight, with X D [ten deniers], fleur de lys with D under it, and a ball and cross below the D, crowned NR, and XVI [sixteen grains]. As the Reale was Spanish, Pommier has not shown weights for it, naturally, but a comment under the André le Fran box might helpfully have mentioned them, as le Fran was also making weights for reales. We would not necessarily know, if these weights were detached from their box, that Lyon makers were catering for people who needed to weigh the Spanish pistole, the Spanish reale and their sub-divisions, and possibly also the English guinea and half-guinea made of gold.

Can any reader explain who might have ordered a box without weights for French coins?

Lyon Coin-Scale Makers 1673-1730

Nicolas Raybay had forty-one competitors working in Lyon during his working life. No wonder Lyon makers looked for customers in other parts of Europe! They nearly all lived in Rue Tupin, with a few round the corner in rue de la Grenette or in rue de 4 Chapaux. Some of them apparently had very short working lives. Illness? The Huguenot dispersals? Ignorance on our part?

BARNAUD,		1668-1675
BERGÉ, Jacques	crowned IB	1671-1693
BLANC, Jacques,	IB	1666-1685
BOUCHARDIÈRE, Gabriel de la	crowned GD	1672-1698
BRUNEL, Joannès	IB over X	1705
CHAMPY, Pierre	crowned PC	1668-1696
CHARRETON, Jean	crowned IC	1672-1688
CHAUDET, Jean-Pierre	IP over C	1668-1680
CLOT Mathieu & PALLAIS Pierre,		1661-1684
CORVAY, François	crowned FC	1724-1730
DASSIN, Pierre	lys D over ?	1724-1730
DAUSSONE, Claude	crowned CD	1694-1695
DEFLACIEU, Barthélémy		1669-1701
DEFLACIEU, Jacques	ID over cross	1676-1730
DEFLACIEU, Jacques & Claude		1729
GALOT, Isaac	crowned IG	1674-1685
GARCIN, Paul	crowned PG	1668-1675
GRAND, Barthélémy		1668-1675
GROBET, Jean		1668-1676
GROSSET, Flury		1724-1730
GROSSET, Jean	star over IG	1677-1709
GROSSET, Laurens	crowned LG	1675-1724
LALUNE, Jacques	crowned IL	1655-1688
LAMBERT, David	crowned DL	1669-1684
LAMINETTE, Giraud		1668-1707
LAMINETTE, Jean-Baptiste	IB over L	1668-1701
LECOCQ, Thomas	TL	1720-1772
MACHIQUE, Dominique		1661-1675
MARION, Claude	crowned CM	1668-1701
MARION, Henri		1697
MARION, Jean	crowned IM	1682-1724
MICHAUD, Jacques	IM	1660-1680
PALLIAS, Pierre	crowned P	1672-1684
PASCAL, Dominique	DP	1722-1747
PINGARD, Jean	crowned IP	1676-1727
PINGARD, Joseph-Emeric		1728-1779
RAYBAY, Nicolas	crowned NR	1673-1730
ROBERT, Jean (père)	crowned IR	1668-1705
ROGON, Pierre	crowned G	1665-1682
TISSEUR, Jean (fils)		1668-1684
VIVIEN, Pierre	crowned PV &	1667-1675

Slow Discovery

BY G WILSON

One member discovers Nuremberg nesting weights

As I write, why do I have this feeling of deja vu? When before have I acquired something casually and discovered its real worth later? Perhaps this happens to us all, at least those of us in the scales and weights hobby and particularly us neophytes. Well, maybe I've been around a little long to claim the "neophyte" title, but I'd like to cling to it. Neophytes have so much fun! Certainly I was a neophyte in collecting weights when I was struck by finding a nearly complete set of Nuremberg nesting weights. I knew little about them then. But to begin my story at the beginning:

Perhaps like some others, I paid little attention to weights when I first got "hooked" on scales. At the time that I first saw this set, I had been introduced to nesting weights, indeed I owned a small, obviously fake set. Nuremberg though, was just a city in Germany to me.

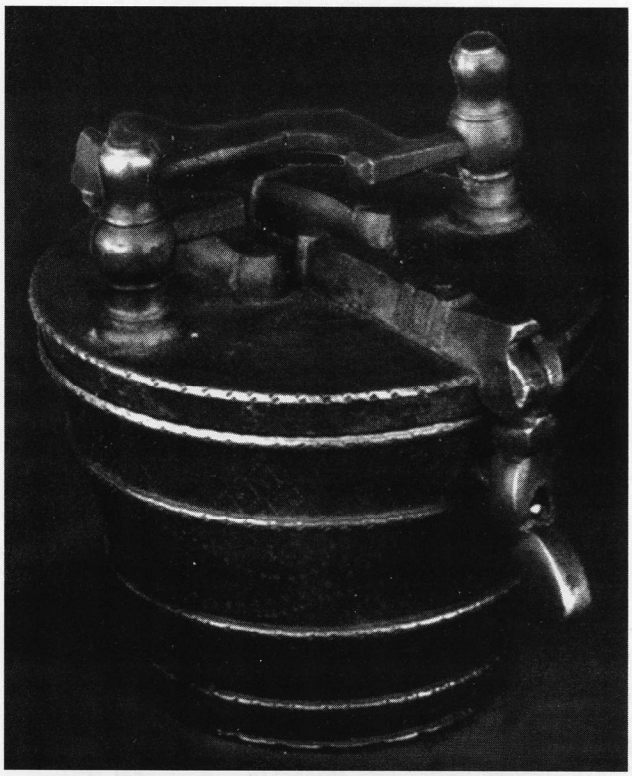


Fig. 1. The set of nesting weights found by Jerry Wilson, weighing 8M in total, that is 1908grams, or about 4lbs. The bigger sizes of nesting weights had a handle, seen here flopped away from the viewer. The two straps for the hinge going each side of the strap for the catch is typical Nuremberg style. Photo J Wilson

I found this set in the usual place, a dusty bookshelf in an antique store. What was it? Under the dust and dirt of years I thought there appeared to be the patina of centuries. On closer examination, I found numerous stampings thereon that promised interesting hours of detective work. Maybe....? I was fortunate. The dealer knew no more about this item than I did and was willing to sell at a price I was willing to pay. I took my new curiosity home.

At home, I'm sorry to report, my initial study was only cursory. I was a scale collector not a weight collector! However, even a cursory study revealed the fact that these were serious tools, not fakes. They were well-made and precisely fitting. Upon weighing them I found precision too, that is to say, the one marked "2M" weighed, quite closely, one half what the one marked "4M" weighed. This was true of the entire series of eight weights, though when the size dropped to "fiM", the marking for units changed to 8, then 4, 2 and 1. Below "1" no units were stated but the halving of weight continued. It was easy to guess what the missing weight or weights should weigh if the halving continued, but how far could that go? The smallest weight I had was tiny. The series could not go on forever. (I remembered the enigma my father had presented to me as a child: "If a spider drops halfway from the ceiling to the floor on his web, then half the remainder, then half the remainder and so on, how does he ever get to the floor?") It was clear the series had to break and soon.

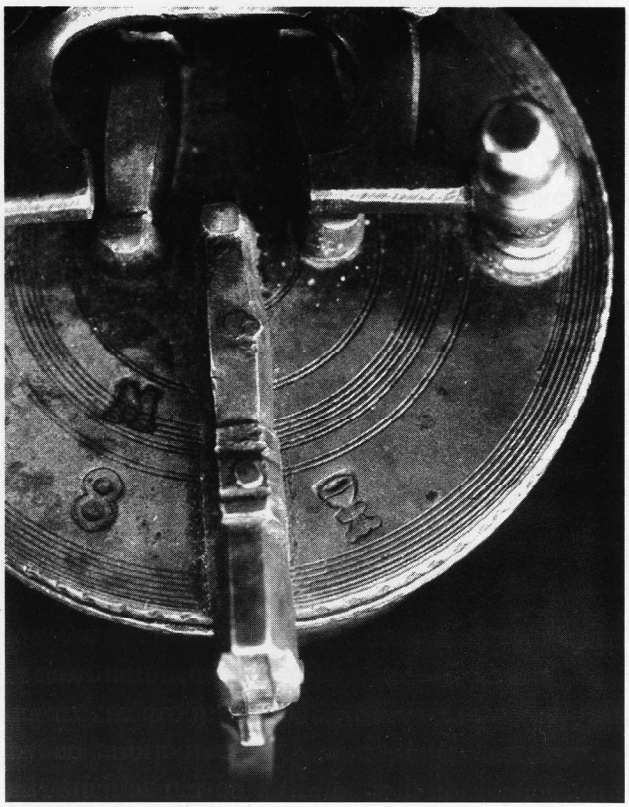


Fig. 2. ➢➢ Lid showing, in positions in accordance with the convention of the era, the unit of measurement to the left of the latch and the mastercraftsman's mark to the right, a chalice in this case. Photo J Wilson

But what was an "M"? Also, one-half an "M" equaled 8 what? By weighing I knew an "M" was about 238.5 grams. The smaller unmarked units had to be in the range of 14.9 grams, for there would logically be sixteen of them in an "M". What were they? And what were the other marks? Some looked like inspection stamps, but what was the winged thing in the bottom of each cup? And what about the goblet or chalice on the lid of the housing that, by the way, was clearly a 4M weight itself?

Puzzled, I turned once more to Ruth Willard, whom I had earlier found to be an enthusiastic researcher. She told me of Bruno Kisch's *Scales and Weights, A Historical Outline,* and of G M M Houben's *2000 Years of Nested Cup Weights*. She also photo-copied some of the text and the nesting weight photos in the Streeter Collection of Weights and Measures, as shown in Ellen Zak Danforth's publication of that collection. The pages from Danforth made it clear that I had stumbled across something special! With my spark of curiosity glowing brightly now, I tracked down a copy of Kisch in a local university library, became absorbed in it, and realized I had to have a copy of Houben, too. Imagine my thrill when it arrived and I found a virtual duplicate of my set on the cover!

The long and intriguing history of nesting (or nested) weights (new to me!) began to unfold. Such weight sets are known to have existed from Roman times! They are believed to owe their popularity to their compactness and ease of transport, for every traveling merchant for centuries has had to transport his own weighing equipment.

While evidence of metal lathe work has been noted even on Roman nesting weights, it was not until the mid-sixteenth century that the perfection of such weights began to emerge in Nuremberg, Germany as an industry. There, utilizing a process that involved metal casting or molding and machine working, master coppersmiths began producing precision nesting weights for the world. Nuremberg continued in this near-monopolistic role for more than three centuries!

The Nuremberg coppersmiths, in order to serve customer states all over Europe, had to adapt the sets to the various standards and denominations that their clients required. Regardless of mass unit nearly all sets were made according to a binary system. The smallest two weights were always of the same mass. Thereafter, progressing upward in size, the mass of each cup was equal to the total mass of all smaller cups, (exactly what I found in my little prize!)

Fig. 3. ➢➢ The chalice [the kelch] was used by Johann Erasmus Fleischmann, weightmaker, from 1725 until at least 1756 when he was made Master of the Guild of Coppersmiths. (He had inherited the mark from his father Erasmus Fleischmann, who used the chalice too, but with E F each side of the stem.) Who used the mark between 1756 and 1765 is not recorded. Johann Reichert [Reinhard] Lenz, weightmaker, inherited the mark from his brother-in-law in 1765 and used it until 1795/96. Christoph Lenz, weightmaker, inherited the mark in 1795 and used it until at least 1818, when he was made Master of the Guild. It is impossible to ascertain which man made these weights.
Information from Lockner's and Kisch's books

Kelch

Typically, the receiving state or jurisdiction, before putting the Nuremberg products into service, checked them for accuracy of weight, made any adjustments deemed necessary, and stamped each weight to indicate that approval. The approval stamp, called the adjuster's or verification stamp, was often in the form of the Coat of Arms of the jurisdiction. Another clue!

From Kisch I learned that the stamp on the lid to the right of the latch (in my case, the chalice or goblet) was the mark of the master craftsman, a required display in Nuremberg after about 1534. Both Houben and Kisch told me that the chalice was the mark of the families Fleischmann and Lenz and that these craftsmen had been active from the late 1600s to the 1800s. But who and where was the customer for my little set?

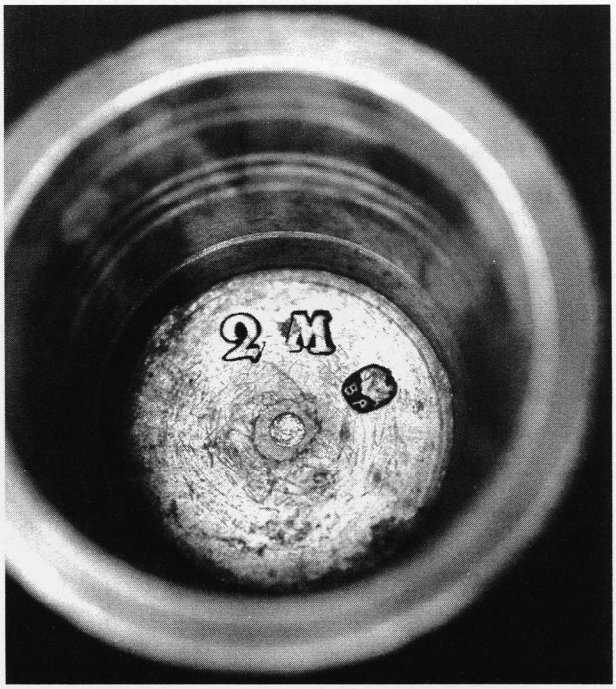


Fig. 4. ⮝⮝ Interior of the two Marca weight. The small stamp to the right, upon magnification, is clearly winged and bilaterally symmetrical. Is it the head of the winged lion symbol of the Doges? Photo J Wilson

I now knew that this customer's unit of weight was an "M" and that it weighed about 238.5 grams. Kisch provided me with a possible answer in an appendix, where I found the Venetian Marca weighed in at 238.5 grams! At this point I had learned that the stamp in the bottom of each cup was the verification mark of the using jurisdiction. Could this stamp, which I had thought to be an eagle, be the winged lion of San Marco, a symbol of the Doges of Venice? My winged stamp, though vague, appeared to have a bilateral symmetry and I'd never seen the San Marco lion portrayed other than in profile.

Fig. 5. ⮟⮟ Left. A photo from the book by Mazza, *I Pesi Monetari di Monete Milanesi*, identifying this as a verification mark. This is accurate. Right. Drawings from the book by Lavagne, *Balanciers Etalonneurs*, purporting to be the lion of Venice. Comparing the BP mark with the original shows the need for scrupulous recording. Sometimes a maker had replacement punches made that differ from the earlier punches, or a descendant used a variation on his predecessor's mark, so extreme care is required when studying marks.

Excitedly, I wrote Dr. Houben with all my details. What did he think? To my delight he replied promptly, informing me that, while the 238.5 gram weight narrowed the field, Venice

was not the only possibility. He said, however, the winged stamp probably clinches the case; the image was likely the head of the San Marco lion, as known from several coins. He congratulated me, saying, "Nested weights from Nuremberg with a handle, adjusted for Venice, are very rare!"

One other bit of information arrived from Gary Batz, a member of ISASC whom I have been fortunate enough to meet. Gary loves to probe deeply into the history of his scales and weights and can provide a wealth of background information. By virtue of his thoroughness and tenacity he has become a recognized authority in metrology. His historical knowledge helped me fix the date of manufacture of my prize. It seems that, because of the Napoleonic wars, the Doges ceased to hold power after 1797. It would seem likely, I conclude, that if indeed, my set is from the era of the Doges, represented by the San Marco lion, it is probably of pre-1797 vintage.

Fig. 6. ⅄⅄ The winged stamp of the adjuster. Could it be a view of the San Marco lion, the symbol of the Doges of Venice? Note the left-hand mark shows the archaic form of the "1" typical of Nuremberg, in this case for one sixteenth of a marca, the weight of this cup. The diamond-shaped stamp below the lion appears on all of the weights and is believed to be an inspector's stamp, having four lobes with 3 in the middle. The right-hand mark is lit from a different angle, and makes the lion stamp look different. This demonstrates the advantage of looking at a difficult stamp with the light-source coming across the stamp from several angles before deciding what the stamp is. Photo J Wilson

And the search goes on! Through the diligence of our editor and our associate editor, new evidence and expert opinions continue to appear, all seeming to support my lucky first guess based only on mass, that the weights units are Venetian. Our Editor has located this exact adjuster's stamp, complete with initials, in an Italian publication by Mazza. (And Mazza shows a second mark, identical except that it has the initials AV in lieu of BP.) While Mazza's publication deals primarily with weights found in Milan, Guido Zavattoni, an Italian enthusiast and expert, has assured her that Mazza's photo is of the winged lion of San Marco, hence is Venetian. Mazza does not provide any text relating to these verification marks.

Our Associate Editor has contacted Ronald Edward Zupko, the author of numerous books and articles on European weight standards including *Italian Weights and Measures: The Later Middle Ages to the Nineteenth Century.* He too supports the winged lion of Venice concept.

Thus fortified and armed additionally with information from Zupko's definitive work and pertinent pages from Kelly's *Universal Cambist* of 1835, I will pursue such questions as:

Fig. 7. ➢➢ My set and the cover of Houben's book. Imagine my thrill on receipt of a book from the Netherlands with a close approximation of my find on its cover! (My two smallest weights are replacements of the missing ones.) Photo J Wilson

a. Who or what was BP, and when?

b. If BP was a mere adjuster, why are his initials so dominant on the logo of his State?

c. What were the subordinate units of the marca used with this set? We know only that there were sixteen of them to a marca. By whom were they used, when, and for what? Currently I know only that Venice used an once, of which eight made a marca .

d, What may be revealed by a study of publications, some cited therein, not yet read?

I've had a year's fun from one little set of weights! But the knowledge I gained included more than knowledge of nesting weights. More importantly I learned of the warmth, enthusiasm and knowledge our members are eager to share. May I urge you to seek out your fellow members with your scale/weight questions? It pays dividends!

Notes & References

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WHY WEIGH SOLDER?

BY J BERNING

In order to understand the reason for weighing solder, we must first consider what it is and what it is used for. According to Webster, solder is a metal or metallic alloy, especially an alloy of lead and tin, used when melted to join metallic surfaces. It is commonly melted by applying a blow torch to a cast iron pot containing the solder or to a soldering iron (which is not iron at all, but rather copper) which is then applied to the surfaces being joined so as to melt the cold, solid solder.

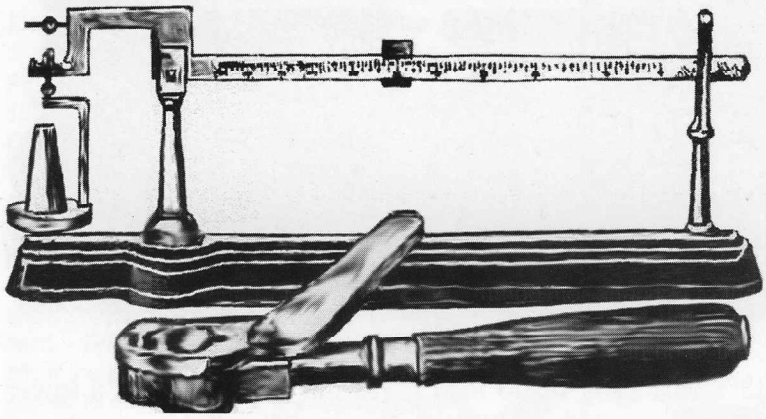
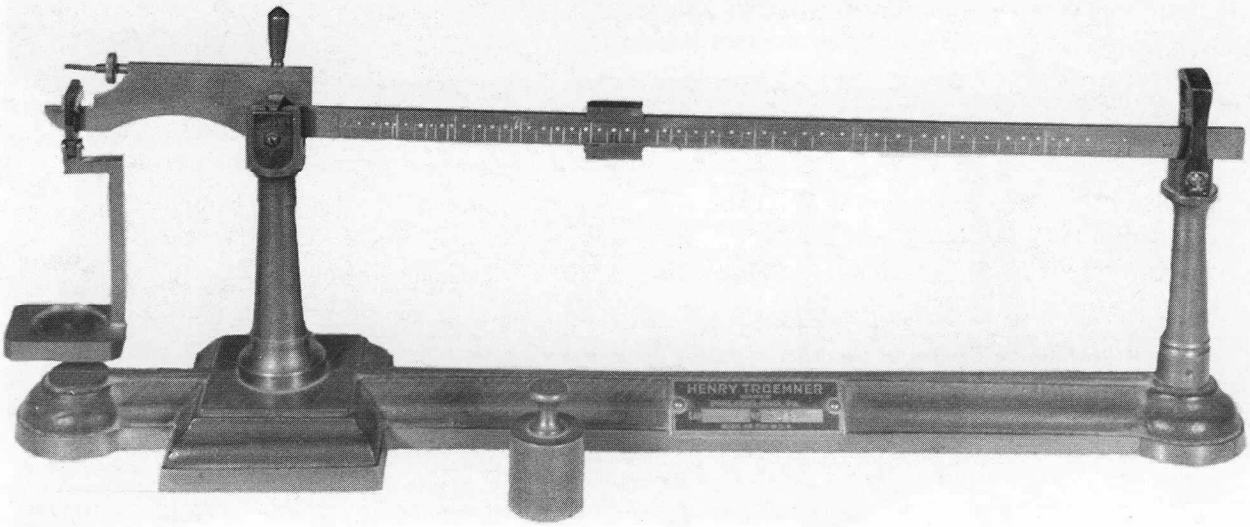


Fig. 1. ≺≺ Fairbanks 1902 Solder Test Scale. *Substantially and accurately made with agate bearings throughout, complete with mould. To make a test, it is only necessary to take a cast in the mould, place the cast on the scale, poise it with the slide weight, and the pointer will show the amount of tin from 0 to 100%. Price of scale, with Mould, $40.00. Handsome Mahogany Glass Case, front counter-poised, sliding door, with drawer, if wanted $12.00.* Note that the design is already settled, and does not alter subsequently.

A flux such as resin, borax, or zinc chloride is applied to the parts being joined so the solder will melt and flow and also to protect the metal surfaces from oxidizing. Unless the surfaces are very clean before the flux and solder are applied, they will never stick together. When soldering two pieces of sheet metal together, the workman usually "tins" both surfaces to be joined, so that they are coated with solder. He then places them in contact with each other and reheats them until the solder melts and the solder's surface tension fills all the small intervening gaps between the two pieces.

Fig. 2. ≻≻ Henry Troemner 1904 Solder Test Scale. The steelyard shown with the calibrating weight in front.
Photo J Berning.



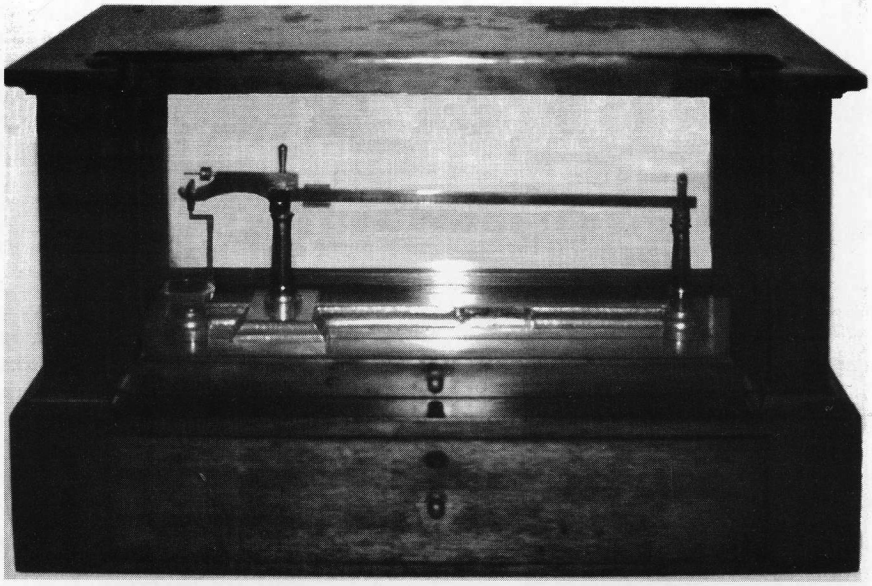
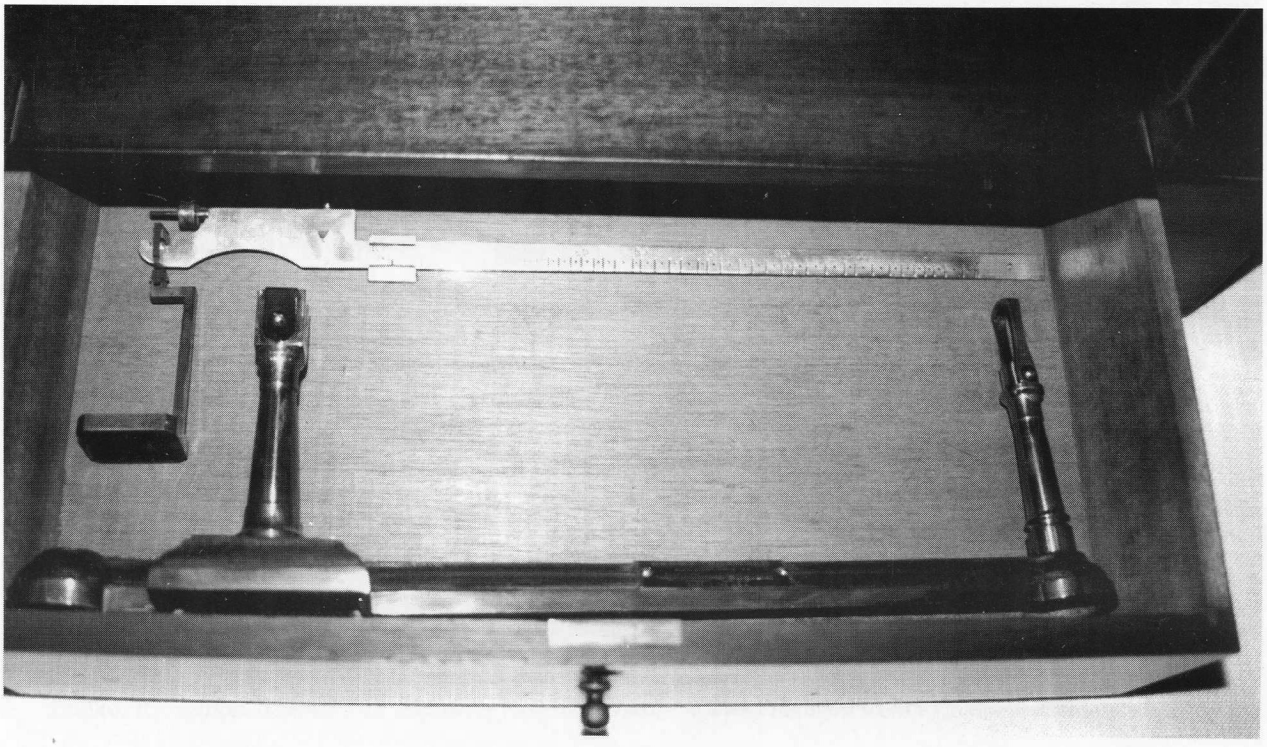


Fig. 3. ➢➢ Henry Troemner's cased version shown assembled for use, but without the mould for the cone of solder. Note that the robust travelling case has no glass in the lid, so the viewer is dependent on the light coming in from the four sides.
Photo courtesy G Higaki

Solders that melt readily are called soft solders. Most soft solders utilize lead as a major ingredient. Lead is a soft, malleable, inert metal that has a specific gravity of 11.3 grams per cubic centimeter and melts at a bit above 327 degrees Kelvin. Tin has a specific gravity of 7.3 and melts at 232°K. Adding tin to lead gives the melted solder a lower surface tension, which increases its ability to penetrate small crevices and "wet" the parts being joined. It also lowers the temperature of the melt, with the eutectic (lowest) melting point, about 182°K, occurring when the lead content is about 37%.

Much of the solder used in the early 1900s was an alloy of lead and tin. At that time the United

Fig. 4. ➢➢ Troemner showing the cased version placed in the drawer for carrying. Photo courtesy G Higaki



States was expanding its municipal water supply and sewer systems using cast iron pipes with a bell on one end and a protruding cast-iron ring on the other to strengthen the joint. The end of the connecting pipe was placed in the bell and the gap tamped half-full of "oakum," an evil-smelling concoction of rope threads and tar. Then a mould was placed around the pipe and the hot lead (solder) was poured in, effectively sealing the joint. It was important that the lead not be too hot, or the oakum would be charred. Therefore it was essential to have at least enough tin in the mixture to reduce the melting point to the desired level. Because tin was considerably more costly than lead, the buyer needed to be sure he obtained all the tin he paid for.

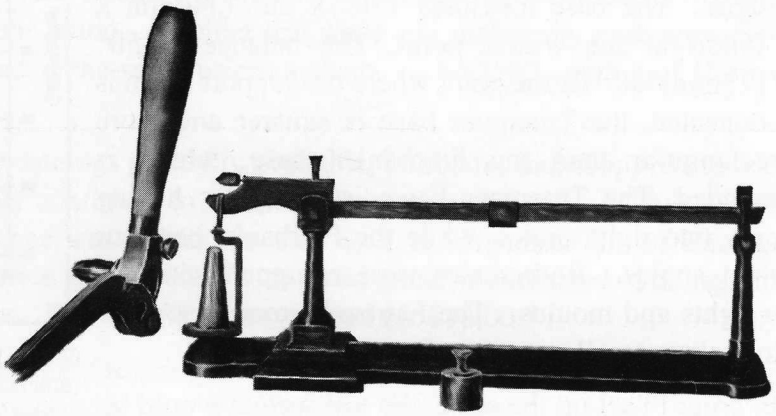
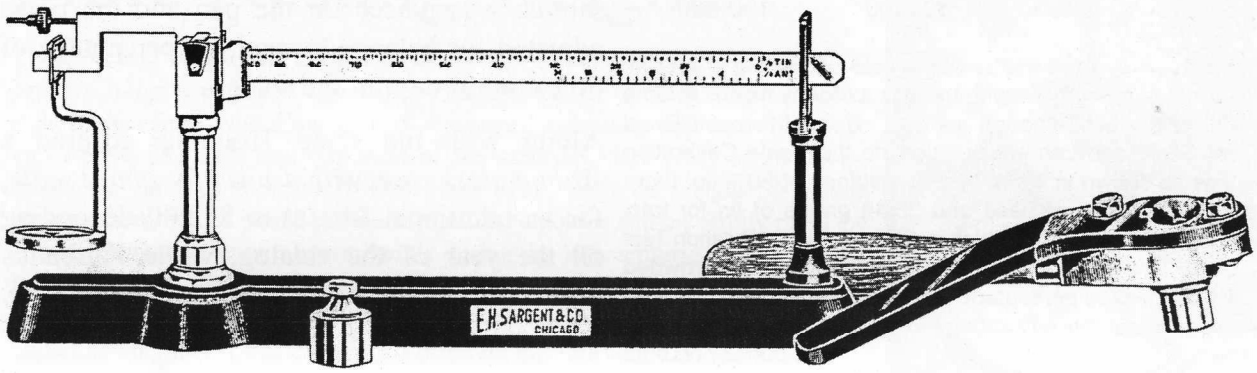


Fig. 5. ➢➢ Troemner advert repeated in the 1920 and 1926 catalogs. *Solder Testing Balance. Fig. 936. With this outfit can be instantly ascertained the percentage of tin in solder; it is only necessary to make a cast of the material in the mould, place this on the pan of Scale, move the weight out along beam until the scale balances, which will show the percentage of tin from 0 to 100 per cent. On the back of beam is a scale to show the percentage of antimony in material known to be made up of lead and antimony. The scale is substantially and accurately made with Agate bearings. The outfit consists of Balance, Mould and 50 per cent Brass Weight. Full directions with each Balance. Walnut Glass Case with drawer for the above scale [available separately.]*

At least two scale makers went after this market. Fairbanks in its 1902 catalog (Fig. 1) and Troemner in 1904 offered nearly identical solder testing scales. Both calibrated their beams to register from zero to 100% for tin. In the event the sample was a tin-lead solder, the beam was read from the front. Because some solders (called hard solders) were composed of antimony and lead, Troemner also calibrated the back of the beam to accommodate antimony's slightly lower specific gravity of 6.7. Those graduations go only from two to 24%. In addition to lowering the melting point, antimony is used to harden the lead and make it brittle, an effect that would be over

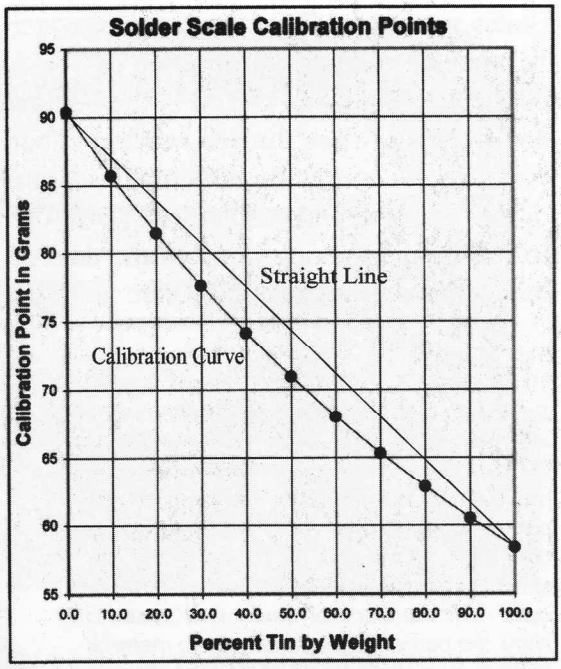
Fig. 6. ➢➢ E H Sargent & Co. Chicago 1945. The traditional design persisted for more than 40 years, suggesting that it was satisfactory for its purpose.



by the time the antimony content reached 24%. The fact that antimony cost nearly 150 times as much as lead made it important to have a quality check. For reasons unknown, the Fairbanks solder scales were not adapted to weigh antimony.

The differences in the scales made by Fairbanks and Troemner are slight. The Troemner scale is made from cast brass with agate bearings and steel knife-edges. The base measures 13fi" x 2fi" (340mm x 60mm) at the widest point. The balance is 5fi" (123mm) tall. At the point where the support beam is connected, the Troemner base is squarer and more rectangular than the Fairbanks' base, which is rounded. The Troemner beam is straighter, having only two right angles, while the Fairbanks has four right angles. Both scales were equipped with test weights and moulds. The Fairbanks mould appears to make a smaller sample than the Troemner.

In order to set up the scale, the test weight would be placed on the small weighing pan, which was indented in its center to fit the weight. When the poise was moved to the beam's 50% mark, the scale should balance. In case equilibrium was not achieved, the beam could be adjusted by use of the end-of-the-beam adjusting nuts just above the pan. The solder sample was made by pouring the melted solder into the hand-held, cone-shaped mould that was included with the purchase of the balance. After the scale was set up with the test weight, the cone-shaped solder sample was placed on the pan and the poise adjusted for balance to read the percentage of tin (or antimony) in the solder.



Graph 1. ⅄⅄ This scale works because lead and tin (antimony) have different specific gravities. The cone-shaped solder sample has a volume of eight cubic centimeters. If it contains 100% tin, it weighs 54.8 grams. If it contains 0% tin (100% lead) it weighs 90.4 grams. Courtesy N Cima

Solder Scale Calibration Points

All Weights in Grams		Sample Volume 8.00CC	
Weight of Tin	Weight of Lead	Sample Total Wt	% Weight of Tin
0.000	90.400	90.400	0
8.570	77.134	85.704	10.000
16.294	65.177	81.472	20.000
23.292	54.346	77.638	30.000
29.659	44.489	74.148	40.000
35.480	35.479	70.959	50.000
40.820	27.213	68.033	60.000
45.737	19.602	65.339	70.000
50.280	12.570	62.850	80.000
54.489	6.054	60.543	90.000
58.400	0.000	58.400	100.000

Table 1. ⅄⅄ Because solder is sold containing a specific percentage of tin by weight, there is a slightly higher volume of tin in the cone-shaped sample. Using Microsoft Excel Goal Seek, one can easily calculate the Scale Calibration Points as shown in Table 1. For instance at 50% tin, there are 35.48 grams of Lead and 35.48 grams of tin for total weight of 70.96 grams, which is equal to the Calibration Test Weight. The tick marks on the graduated chart are crowded towards the high percentage end of the scale. This can also be seen when the calibration data is plotted in the curve of Graph 1. Courtesy N Cima

Along with the scale Troemner offered a *Walnut glass case, with drawer for above scale*, for an additional $10.00 to $22.00 depending on the year of the catalog, while Fairbanks offered a *Handsome mahogany glass case, front counterpoised sliding door, with drawer*

for $12.00. The balance was sold from 1904 to at least 1912 at $40.00 in Troemner's catalog and also in Fairbanks' 1902 and 1906 catalogs. Troemner's sold it for $65.25 from 1915 through at least 1921, and for $72.50 from 1926 to 1930. In the later years Troemner also offered the mould separately for $17.75. In each catalog the solder scale was one of the most expensive scales offered, presumably because it was made of solid brass and had a relatively small market.

Both Troemner and Fairbanks appear to have marketed their scales through additional outlets. One collector has a scale identical to the Troemner that is marked *J Richards, Philadelphia*, on the front of the beam. J Richards is believed to have been a distributor rather than a manufacturer of scales since no other record of him has been found. A solder test scale and mahogany case apparently identical to the Fairbanks and offered at the same prices appears in the 1902 catalog of Herman Kolbusch.

As far as can be ascertained from the catalogs presently available, Fairbanks had dropped the scale from its line by 1912, while Troemner continued to offer it at least through 1930. As late as 1945 a strikingly similar Solder Test Balance was offered for sale by E N Sargent & Co. of Chicago, believed to be a distributor. The price was $60.00 with mold (note modernized spelling) and calibrating weight, but without a case. Extra molds were offered for $18.00.

Queries were made to several solder-manufacturing companies. None of them had ever heard of a solder-testing balance. Manufacturing solder is far more precise than it was in the early twentieth century and chemical analysis is now the favored way to determine solder content.

Acknowledgements

Thanks for their assistance go to W Berning, N Cima, W Doniger, and J Katz.

Sources consulted:

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Kohlbusch catalog, 1902.

Troemner catalogs, 1899, 1904, 1909, 1912, 1920, 1926, 1930.

Barker, H. *A Pictorial History of the American Scale Industry* 1850-1950, p 275.

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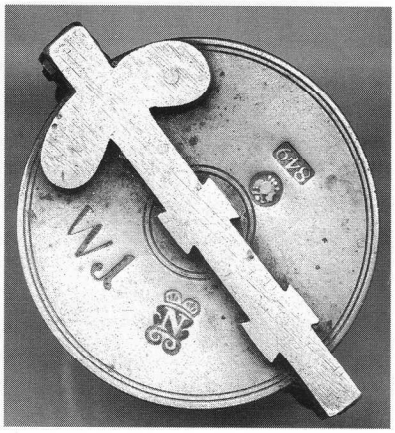
More Nesting Weights



These nesting weights are designated as "post-1800 Austrian" in Houben's *5000 years of Weights*, page 65. The Austro-Hungarian eagle with two heads is to the right of the centre, with the number 849 stamped separately below it. The outer cup weighs 282g, an approximation of the Austrian Marc (1M) of 280.644g. Inside the cup it is stamped 16 (16 loths). The whole set weighs 564g, one Austrian commercial pound (a Handelpfund). Napoleon and his family ruled the Austro-Hungarian empire intermittently during the 19th century, and Austria did not go metric until 1873. Note the single strap across the lid, bearing the hinge at one end and the catch at the other. The lid is made of yellower brass than the cups, showing that it was cast from a different mixture of the alloy.

Notes & Queries

N & Q no. 143	C SIMPSON

I recently bought a box of weights for assay tons, which appear to be chromium-plated. When was chrome first used to plate weights?

My old catalogues show analytical weights in brass, nickel-plated, gold-plated, German silver (or new-silver), aluminium, platinum and even phosphor-bronze, but not chrome.

Reply	Editor

I found chromed weights in Gottlieb Kern's catalogue of 1933, whereas in 1900 they had nearly all their weights made of brass, nickel-plate or phosphor-bronze, (or gold-plated or platinum-plated at ten times the price). Can any reader give us better dates for the use of chrome for weights?

Assay tons were differently expressed on each side of the Atlantic. Gerard Houben, in his book *5000 Years of Weights*, published in Zwolle in 1990, explains thus:
Trade and industry that exploit ores from which metals are obtained are interested to know the quantity of noble metal that is present. It would be logical to express it in grams per 1000 grams of ore. But the UK and the USA have quite an influence in the world of metals and they utilise the avoirdupois as well as the troy systems, hence a strange method of indicating the metal content.

Ore is a cheap bulk product. Its mass is therefore expressed in tons avoirdupois. However, quantities of noble metals are indicated in the troy system. As a consequence, the quantity of a noble metal in an ore is expressed in troy ounces metal per avoirdupois ton of ore. One short ton is 29167 troy ounces. When a laboratory technician starts from 29.167 troy ounces of ore and obtains 0.001 troy ounces of noble metal, then the content would be one troy ounce per ton of ore. However, he is accustomed to weigh in grams, so he weighs 29.167g and obtains milligrams.

Prof. C F Chandler of the School of Mines in New York proposed naming the mass of 29.1666g an assay ton. The mass unit is indicated as A/T or as TON. These weights are made by H Troemner & Co in Philadelphia, W & LE Gurley in Troy, NY, and by G Kern in Germany. They are cylindrical brass weights with high slender knobs, as is usual for precision weights. A small box with a velvet lining contains a series with the indications : 4 TON - 2 - 1 - 0.5 - 0.4 - 0.3 - 0.2 - 0.1 and 0.05

However, in the UK a long ton (= 20 long cwt = 2240 lb. avoir) is used. This leads to a figure of 32.667. Consequently the mass of the assay ton weight from producers in England (Oertling of London and Becker's Sons) is 32.667g. On such a weight could be indicated: 504.12 GRAIN. Sometimes they are gold-plated.

Also you might be interested in this note from Christian Becker's 1901 catalogue:
The assay ton weights have been introduced by Dr. C F Chandler of the School of Mines, Columbia College, New York, where they are now in use for convenience in the assay of ores. The weight denominated by Dr. Chandler "One A.T." equals 29.1666 grammes, and contains consequently as many milligrammes as there are Troy ounces in a ton avoirdupois of 2000 lbs. Therefore, if one A.T. of ore assays 1 milligramme, the ton contains 1 ounce troy.

Survival of the 8-lb Stone

BY R D CONNOR

Taken from *The Weights and Measures of England*, page 335-336. This follows up on the comment by Geoff Newall in EQM page 2504.

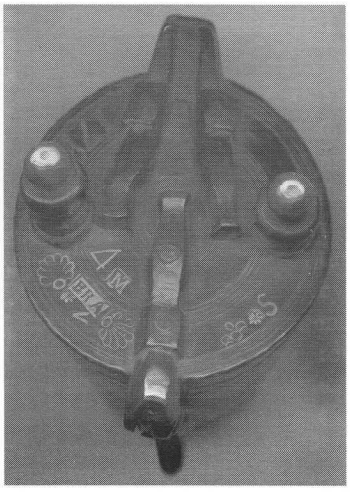
The Report of 1820 says that the stone of meat is eight pounds and in 1834 we read: *And whereas by local customs in the markets, towns, and other places throughout the UK, the denomination of the stone varies being in the country generally deemed to contain 14-lbs Avoirdupois and in London commonly 8 of such lbs or otherwise (be it) enacted ... after 1 Jan 1835 a stone shall in all cases consist of 14 standard lbs Avoirdupois ...*

A century later the eight-pound unit is still alive and well, for we read in the Memorandum to Inspectors of W & M from the Standards Dept of the Board of Trade, dated Dec 1934: *W & M Regulations 1907, Regulation 18 and Instruction 18. Graduations in units of 8-lbs. ...butcher's steelyards and other types of weighing machines graduated in 8-lb units (the old London or butcher's stone), the attention of inspectors of W & M is directed to the following arrangements which have now been made with local authorities of the areas principally affected.*

New machines graduated in 8-lb units will be accepted for verification and stamping until 31 January 1935 it being understood, (1) that after that date no new machines so graduated are to be stamped, (2) that such machines as may then in use will be restamped from time to time after repair and adjustment until 31 Dec 1939, (3) that after this latter date all machines submitted for verification or reverification may be graduated in legal units only, (4) that during the transition period machines may be graduated both in 8-lb units and in legal units or fitted with an attachment of the nature of a conversion table in any manner which may be regarded as satisfactory by the Board of Trade...

It boggles the imagination how the 8-lb stone could have continued right up to well within living memory in spite of the host of declarations, Parliamentary Acts, regulations and decrees that the stone for all items should be 14-lb, and when a statute of 150 years ago so declares and we find precisely 100 years later an official document speaking of the 8-lb unit on the one hand and legal units on the other, we have a situation fit to make the angels weep.

More Nesting weights



This set has lost its handle, as have many sets. The posts coming vertically up from the lid have a tendency to work loose, and the handle falls out of the horizontal holes in the posts. But it enables the viewer to see clearly the two straps of the hinge and the one strap of the catch. This 4M set bears, on the right, three marks, a crooked fleur-de-lys, a tiny flower and an S. On the left are the date 1781 and 4M, BRA, a tiny flower, a V, and the maker's stamp, a scallop shell. This mark is not recorded by Lockner, although the set bears all the signs of having been made in Nuremberg, including decorative lines interspersed by dotted semi-circles and dotted inverted Vs, round the sides. Lockner records the names of many weight-makers without stating what stamp they used, so perhaps one of these used a scallop shell for his mark. Could the BRA stamp be Brabant or Braunschweig? This set has so much lead added underneath that it seems likely the set was adapted for use after metrication.

Another German Coin-op

BY R HOLTMAN

This German coin-op scale was made for the Netherlands, having its instructions in Dutch. It was in use between 1921 or 1922 and 1942 at the druggist shop of the firm H J Kouwenhoven in Delft. It was bought by the NMi Museum IJkwezen in Delft in 1983 and subsequently restored to working order, although it is a bit inaccurate (give or take a few kilogrammes).

The brass plaque says in Dutch *Ticket issuing coin-operated scale* and below *Seitz Werke Kreuznach,* that is *Seitz Factory at Kreuznach.* Originally the customer had to insert 2 x 2fi cent pieces (2 halve-stuivers) but nowadays it works with 2 x 5 cent (2 stuiver) coins and issues museum tickets from its tray (which is labelled *Hier kaarten*, or *Tickets here*). Next to the dial is the text *2 x 2fi Centstuk inwerpen nadat de schijf stilstaat*, that is *Insert 2 x 2fi cent coins after the dial stops moving.* The weight is printed on the front of the ticket while the date was printed on the back.

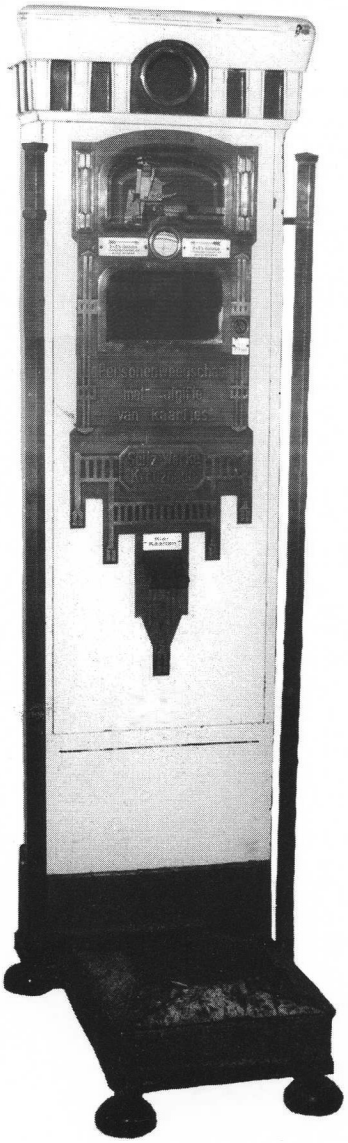


Fig. 1. ➢➢ Seitz Werke coin-op from the early 1920s. Note the tiny platform on which the customer had to balance in the days when many ladies still wore long skirts.
Photo courtesy R Holtman
Courtesy NMi Museum IJkwezen

Fig. 2. ➣➣ The art-deco plaque is so distinctive and typical of its period. Photo R Holtman
Courtesy NMi Museum IJkwezen

Biography

Ritzo Holtman is the editor of *meten & wegen*, the journal of the Dutch society for collectors of weights and measures.

More Nesting Weights

The nesting weights shown on page 2520 have three straps across the lid. In Britain the lid was normally flat, with the hinge and the catch attached to two lugs that extend out from the lid. This set, with a total weight of 8oz. avoirdupois, was made by Laurence of Milner's Court, Guestrow, Aberdeen. John Laurence joined the Corporation of Aberdeen Hammer-men in 1800, on presentation of his essay pieces, *a box of brass weights of one pound, another pound of flat weights, and a house bell.* The Scottish term "a box of weights" probably refers to nesting weights.